Rubber Journal and International Plastics

VOL. 139 NO. 4 JULY 23 1960 Price 1s. Weekly

TY-PLY

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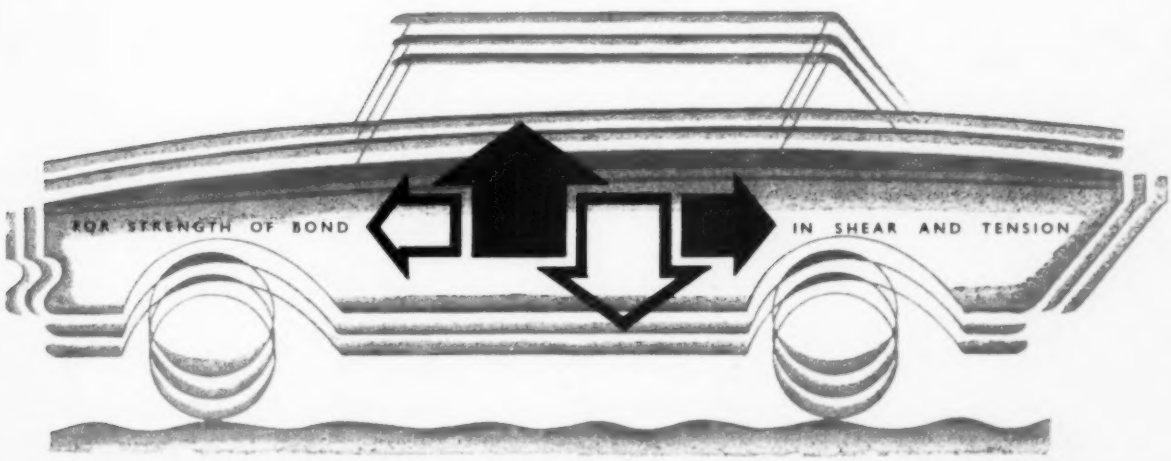

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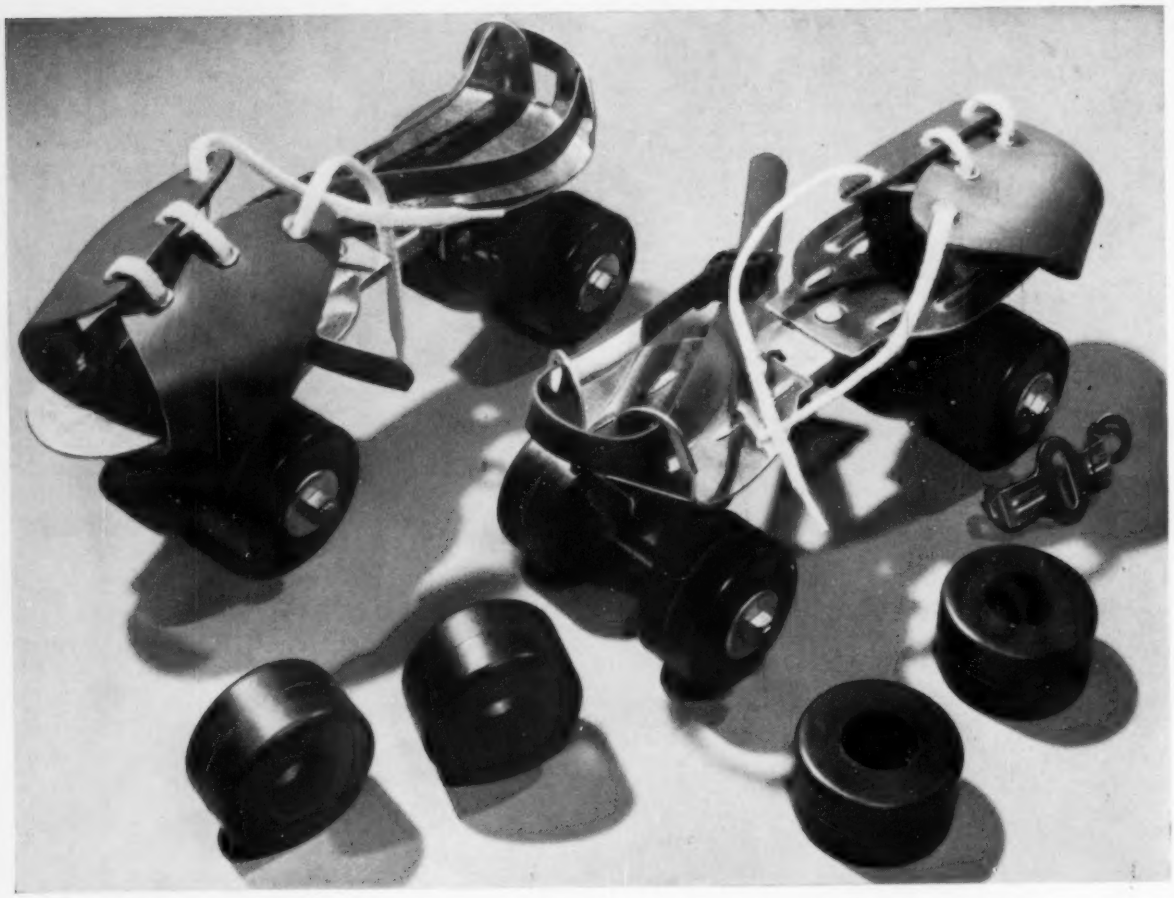

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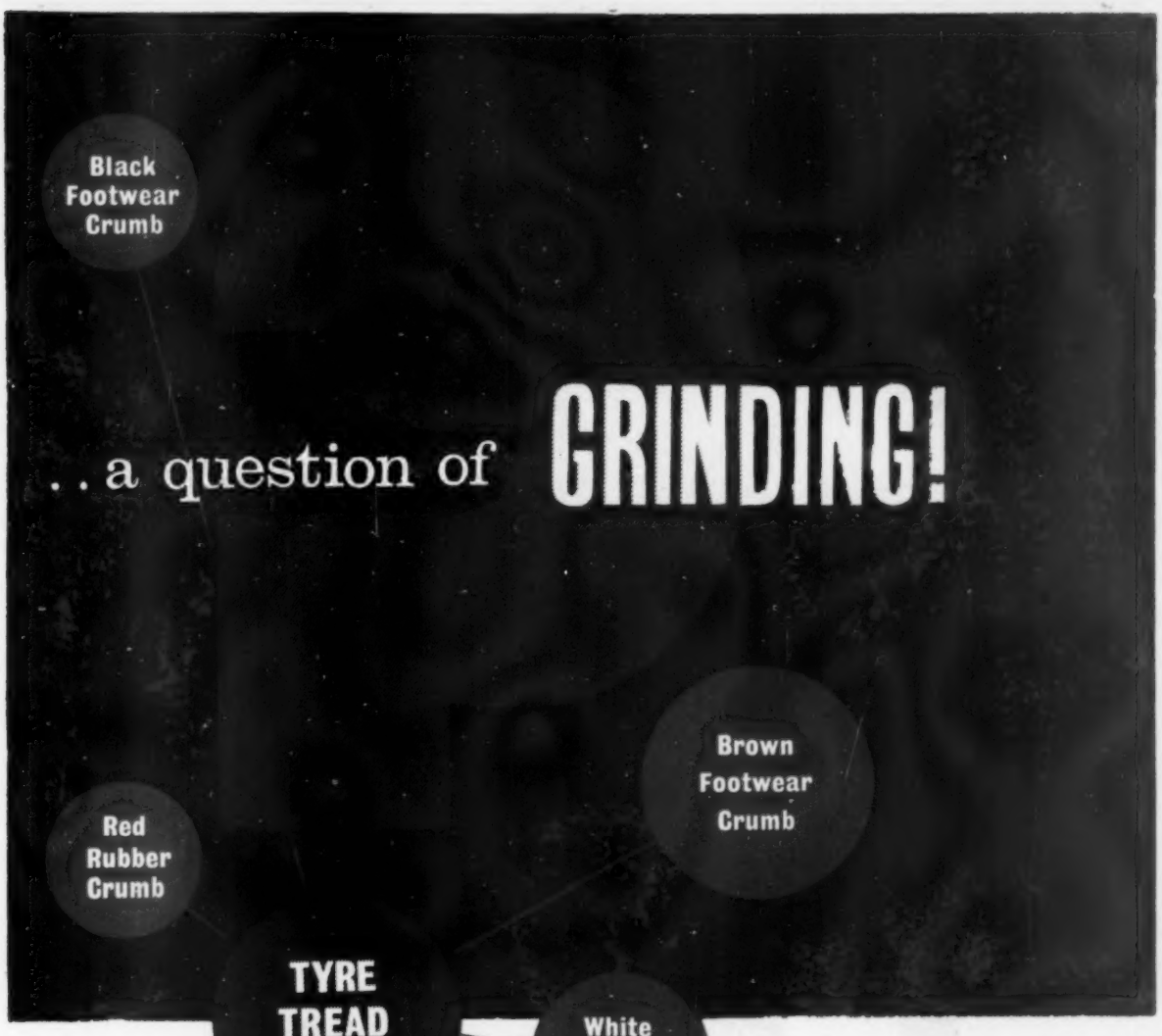

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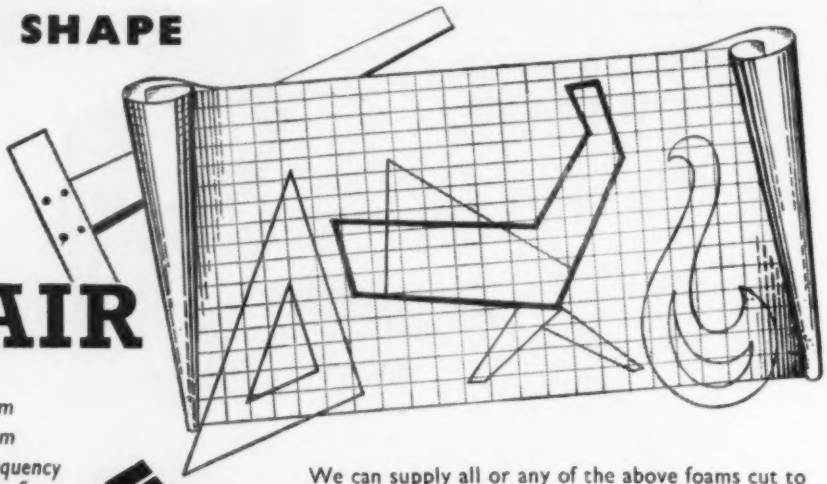

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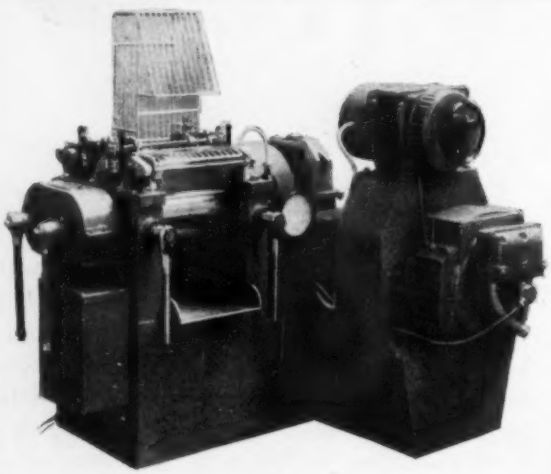

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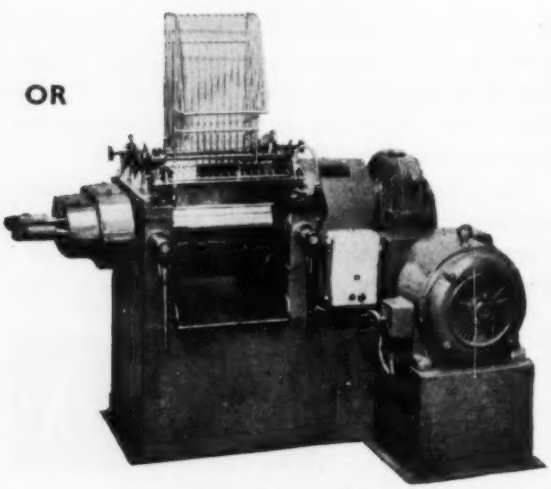

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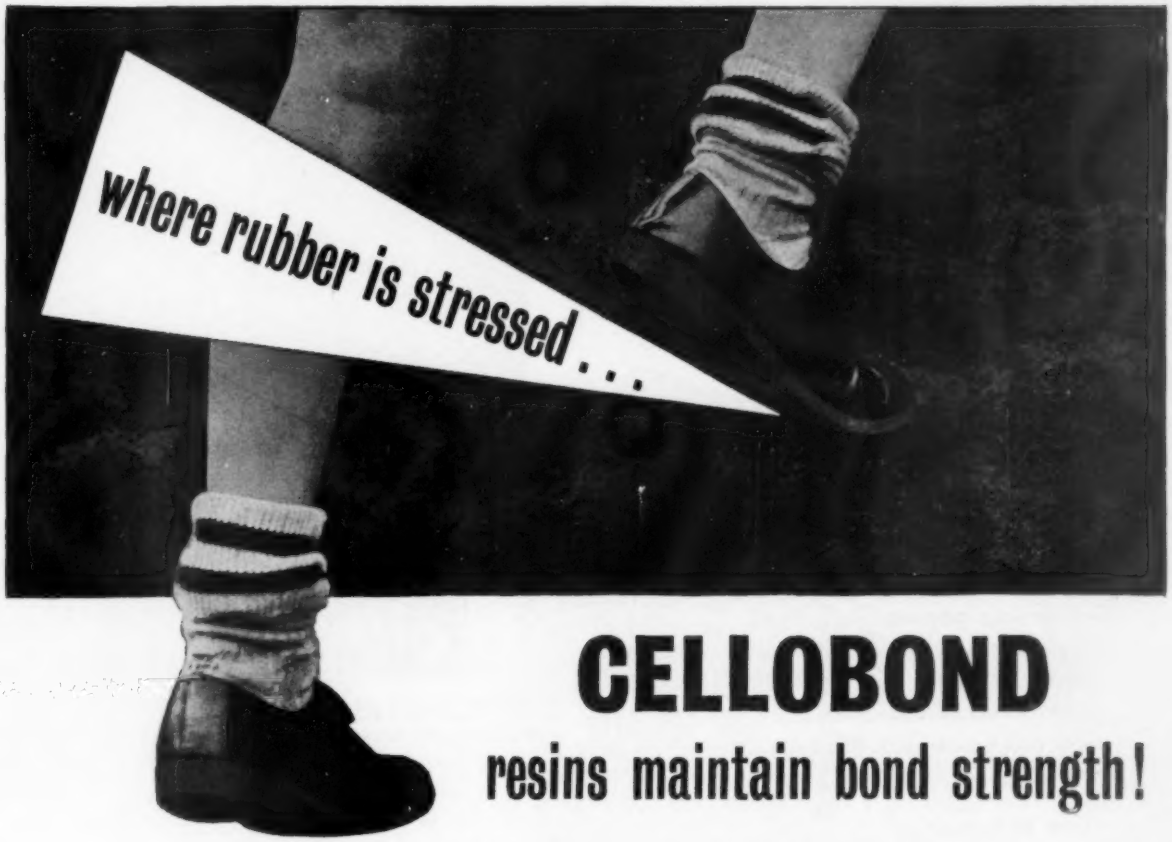

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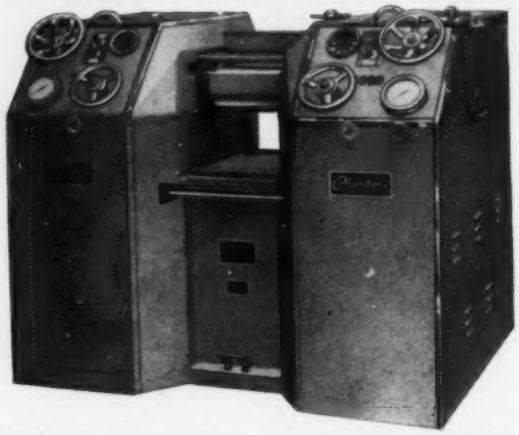

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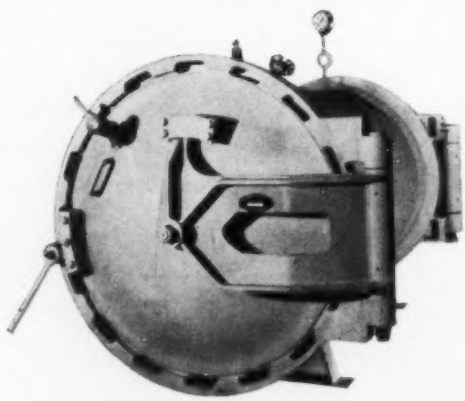

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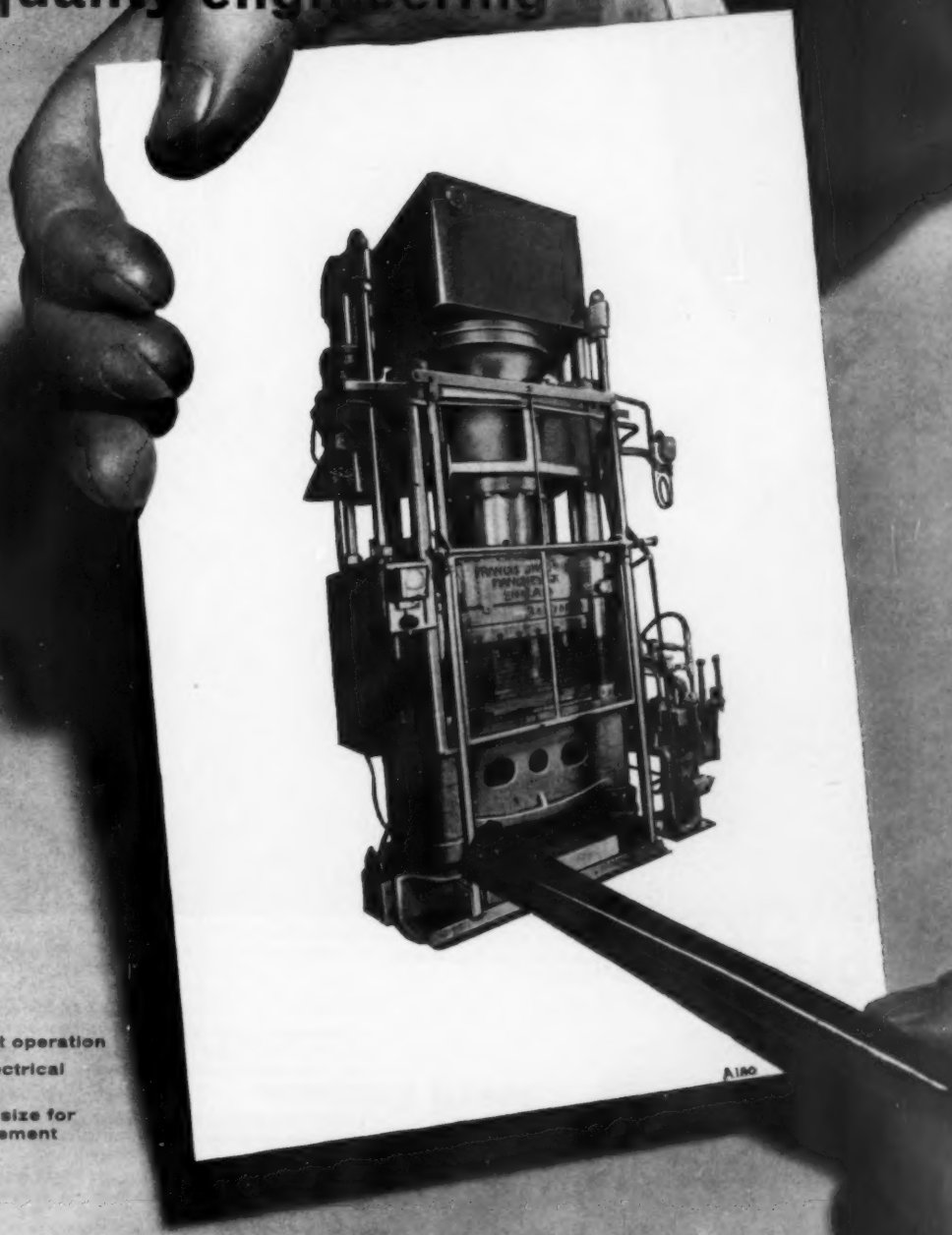

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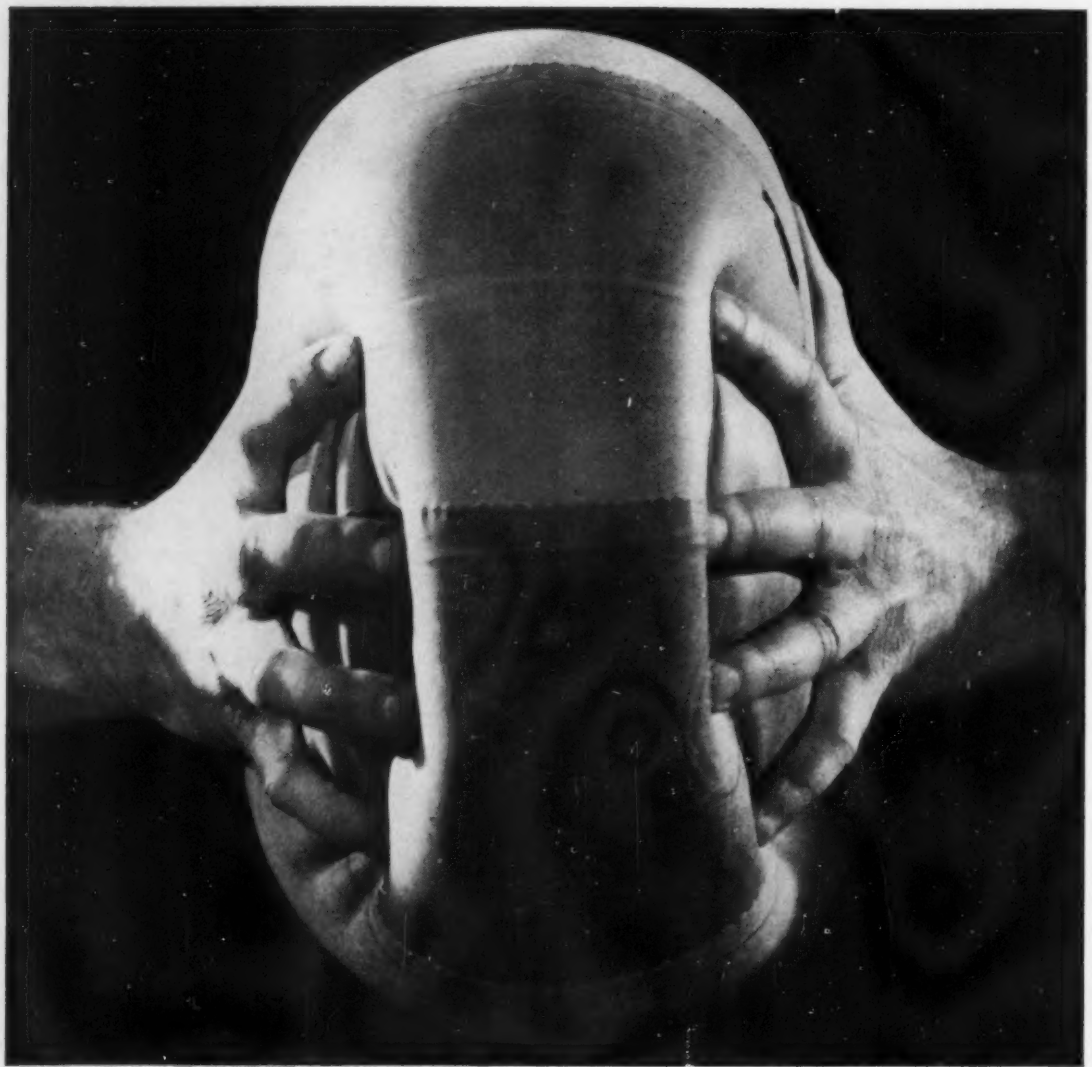

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IN ITS 76th YEAR

July 23 1960

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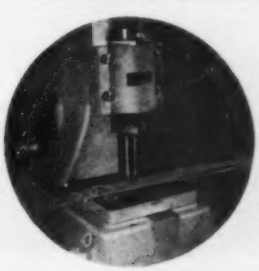

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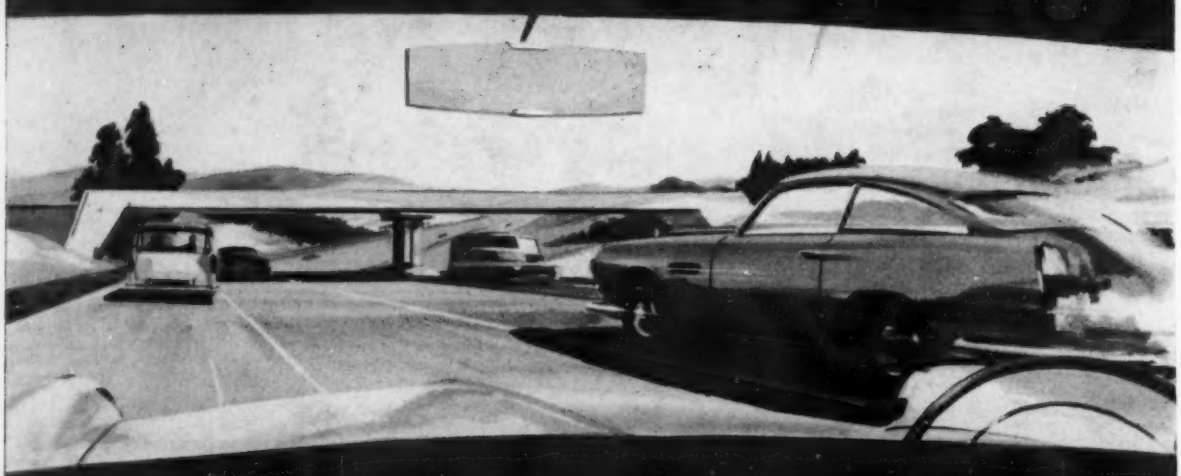

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PGA P10

NOTES of the WEEK

Report on Natural Rubber

NATURAL rubber prospects appear extremely good, states the annual report for 1959 of the Natural Rubber Development Board, published this week. The statement is backed up by some very impressive figures concerning the use of natural rubber in many and varied fields. It is pointed out that there are comparatively few countries in the world without road sections of rubberized surfacing. Recorded road layings for 1959 total 116 miles in seven countries. As a rough guide to quantity, it may be added that approximately 3,000 gallons of latex/bitumen emulsion to the mile is the usual rate of application, although this is not the only method used. The annual usage of rubber in the building and engineering industries, for instance, now accounts for a significant percentage of all dry rubber consumption. Examples given in the Report (mentioned elsewhere in this issue) include dockside fenders, rail pads and, of course, the all-rubber suspension of the BMC small cars.

Reinforced Plastics

THE news, recently reported, that the Plastics Institute has formed its first specialized group, the Midlands Section, Reinforced Plastics Group, is a further indication of the growing importance of this branch of the industry. The event stresses likewise the increasing emphasis on specialization in the industry. The intention is that this new group, the nucleus of which will be the members of the now-dissolved Midlands Reinforced Plastics Society, shall become a national Group within the Plastics Institute, operating directly under the Council. Meetings are to be held in any section area as interest requires. The new Group will fill a demand that has become increasingly apparent, and healthily vocalized.

Not on Tap

THE general idea that the man of science is ' coldly logical, unimaginative, essentially materialistic and indifferent to ordinary human considerations ' is shot down in no uncertain terms in an article in the current issue of *Catalyst*. Writing in this first-rate industrial journal of the Shell Chemical Company, Sir Cyril Hinshelwood, president of the Royal Society, says: ' If people only stopped to think they would surely realize that this conception is nonsense.' He goes on to say that many people genuinely believe, for example, that nuclear physicists have no vision or solicitude beyond their professional occupations and would be indifferent to all human implications of atomic warfare, ' though a physicist immersed in his profession is in fact a good deal less dangerous than a politician interested chiefly in his career.'

This attitude, writes Sir Cyril, leads to the following kind of argument. Knowledge of the material world, it is said, does not give you the kind of wisdom necessary to manage affairs. Therefore, so runs this utterly illogical argument, men of science are necessarily unfitted to be in control. He quotes the famous slogan ' on tap but not on top,' and goes on to stress the fact that ' in no field at all is mere knowledge sufficient to make the wise man, wisdom being a product of inborn qualities and experience of living. Proper qualifications for the direction of affairs or enterprise of any kind constitute a complex combination of energy, wisdom and other elements of temperament and character.' Some, including men of science, possess these; others do not.

Sometimes on Top

THESE facts, says Sir Cyril, are often brushed aside in the light of a supposed principle that the men in charge of the higher policy involving science need know nothing about it. They can be briefed by subordinate scientists, ' on tap but not on top.' He goes on to say that ' if, in a given concern, the scientists are destined to remain in a subordinate rank the better ones will keep out altogether, and what the " tap " delivers will be pretty flat and second rate.' Another aspect of ' this pernicious principle,' says Sir Cyril, is that if major decisions are all to be made on the basis of second-hand knowledge, the function of higher direction ceases to be creative. In an article that well repays reading in full, Sir Cyril Hinshelwood concludes by saying that although the scientist in industry may and should be sometimes ' on top ' . . . he is definitely not merely ' on tap ' but is an organic part of the whole concern.

Top Twenty

THE continued remarkable progress of the plastics industry makes it unsurprising that a plastics company should appear in the *Financial Times* Top Twenty for the first six months of this year. The company is British Industrial Plastics Ltd., subject of a recent take-over bid, who are placed fourth in the list and marked as showing a 113% rise. The figure is compiled from share price quotations on the basis of capital appreciation over the first six months of 1960. The plastics industry as a group scored the second largest rise recorded, over a quarter.

NEWS *Briefs*

ALLIED PLAN ANOTHER POLYETHER PLANT
DUNLOP (SA) CUT STAFF—GOODRICH PROJECT
IN SOUTH AMERICA — JAPAN IMPORTS FREED

United Kingdom — The list of imports from Japan now freed from control includes asbestos manufactures, plastics holloware and tableware, and office materials made of rubber. This follows the new trade agreement signed with Japan. The list of quotas up to March 31 1961 includes a quota for polyvinyl alcohol resin of £450,000.

United States — The Sunray Mid-Continent Oil Co. has announced that its subsidiary, Suntide Refining, will build a styrene unit at Corpus Christi, Texas. Production will be 60m. lb. a year, and the entire output is said to have been already sold under long-term contracts.

South Africa — Dunlop (South Africa) Ltd. have dismissed 208 white and African employees from their Durban factory because of the Far Eastern boycott of South African goods, according to director R. S. Beacham. This is the biggest staff reduction in the firm's history. Mr Beacham said a recent consignment destined for the Far East had had to be unloaded on the eve of the ship's departure from Durban. In addition, 'many other orders for Malaya and the Far East' due for delivery in the next six months had been suddenly cancelled.

Canada — Shipments of asbestos during May showed a sharp increase at 106,214 tons, compared with 96,053 tons in the previous month and with 91,257 tons in May 1959.

West Germany — Farbenfabriken Bayer A.G. is considering applying for a quotation on the London Stock Exchange, according to a report from Bonn.

India — Polychem Ltd. of Bombay, who are making polystyrene under licence from Dow Chemical, plan to set up a styrene monomer plant with a capacity of 15m. lb. a year. Ultimate capacity will be from 20 to 25m. lb. and the undertaking represents a capital investment of Rs.2,300,000.

Ceylon — One of the factories expected to be built on the country's first industrial estate will be for the manufacture of rubber goods. The estate will be located on a 70-acre site near Colombo. Factories are expected to be completed early next year and over forty applications for tenancy are reported to have been received, including a number from the UK, USA and Western Germany.

Malaya — The multi-million dollar Fung Keong rubber factory at Klang, 20 miles from Kuala Lumpur, plans to erect plant to manufacture tyres and tubes towards the end of this year. Five hundred extra workers will be taken on when the project gets under way. The factory has more than $2m. (Malayan) worth of machinery, half of which was installed recently.

United States — The B. F. Goodrich Chemical Company has announced plans to construct a factory in Colombia, South America, for the manufacture of Geon vinyl plastic. The plant, to be built in co-operation with Columbian participants, will be the first to produce polyvinyl chloride in that country, according to Mr Harry B. Warner, the president. A new company organized for this purpose is now being formed, Mr Warner said. Construction will get under way shortly and production is expected to begin early in 1962, he said. The factory will be located adjacent to the plant of Planta Colombiana de Soda, at Zipaquira, near Bogota, which will supply chlorine, one of the primary raw materials.

Germany—West Germany's rubber tyre production in May rose to 20,065 tons (provisional) from 18,159 tons (revised) in April, the Federal Bureau of Statistics states. Output in the first five months of this year totalled 95,666 tons (provisional) against 76,836 tons (without the Saar Region) in the corresponding 1959 period.

United States — A plant to produce 20,000,000lb. of polyethers annually will be constructed at Baton Rouge, Louisiana, by the Allied Chemical Corporation, it was announced here. The company added that initial production at the polyether plant was scheduled to start in the middle of 1961. This marks the second expansion announcement by the company in the uretane field in recent months.

'Who got the Colwyn Medal?'—494

P.V.C.-coated 'Terylene' flexible ventilation ducting in use at Parsonage Colliery, Leigh, Lancashire

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'TERYLENE' Polyester ICI Fibre

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I.C.I. Plan Nylon Expansion

CAPACITY TO BE INCREASED BY 15,000 TONS

IMPERIAL Chemical Industries is to expand its production capacity for nylon polymer. £10m. is to be invested in raising the capacity by an additional 15,000 tons a year.

The company states that this step has been taken 'to meet the expected increases in demand for nylon from the textile and plastics industries.'

Existing I.C.I. plants and the one at present under construction are designed for the production of nylon 66 polymer, but the new extension will produce caprolactam, the monomer for nylon 6 polymer. This has not been manufactured in UK before.

Connexion with BNS

This decision may be connected with expansions at the Gloucester factory of British Nylon Spinners, which is jointly owned by I.C.I. and Courtaulds. Two months ago BNS announced that a second phase of expansion would include further provision for the industrial yarn market—including tyres — and would be in type 6 nylon (*RJIP* May 28, 795).

It seems likely that a large proportion of the extra I.C.I. capacity will be used by BNS in the manufacture of tyre yarn. At BNS's first industrial convention held in May, a spokesman said that, although the use of nylon reinforcement for tyres was of some size in the UK, it was so far of minor magnitude compared with the USA. It was expected that this would become a major market within the next three or four years, and plans were being made accordingly.

PIPELINE PLEA IN THE HOUSE

D. M. Bell, managing director of I.C.I.'s heavy organic chemicals division appeared on July 19 before the Select Committee of the House of Commons who are considering the Esso Petroleum Bill. The oil company is seeking compulsory purchase orders over land through which they plan to lay pipelines, including one from Fawley to Avonmouth, which will feed with ethylene gas the I.C.I. plant being constructed there.

Mr Bell said that if the pipeline was not laid the growth of exports by Britain's only large exporter of petro-chemical products could be seriously inhibited. Soon after the Avonmouth plant was completed, he said, exports of ethylene glycol could be worth £500,000. If the Avonmouth project went through the company could win a share of the market, particularly in the Scandinavian countries.

IRI 1960 MEDAL AWARDS

The Colwyn Medal for 1960 has been awarded by the Institution of the Rubber Industry to Dr E. Konrad, former director of Leverkusen Laboratories, Farbenfabriken Bayer, for conspicuous services to the rubber industry especially in the field of synthetic rubber developments.

The Hancock Medal has been awarded to Mr C. B. Copeman, chairman of Maclaren and Sons Ltd., proprietors of RUBBER JOURNAL AND INTERNATIONAL PLASTICS, for outstanding services to the Institution and in the publications field. Mr Copeman has been a member of the IRI from its foundation and is a past vice-president.

Dutch Interests in Ireland

A NUMBER of Dutch companies, including manufacturers of plastics and rubber products, are expected to establish subsidiary production plants in Eire, according to a *Financial Times* report.

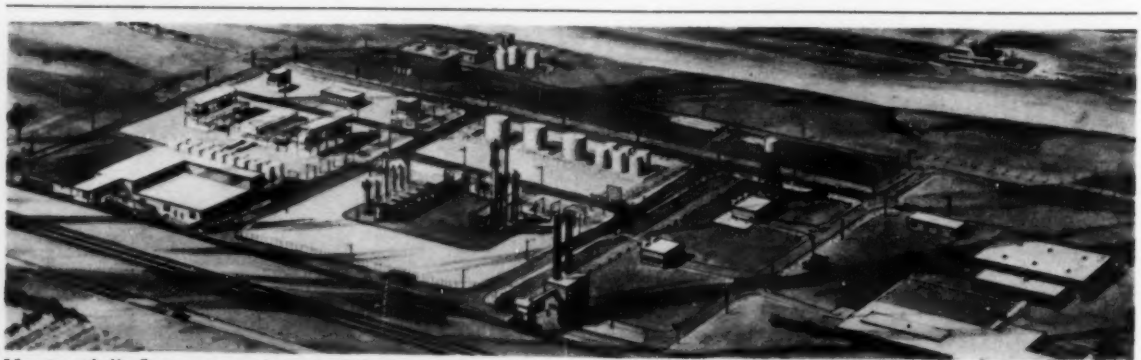
The European director of Eire's Industrial Development Authority, Gerard B. MacCarthy, who is now in Holland meeting interested industrialists, said that already six large and medium Dutch concerns would probably set up units in Eire.

The main reason for Dutch interest is said to be the acute shortage of labour in Holland. Subsidiary factors are: Eire is prepared to give substantial financial help for projects; foreign companies pay no Eire income-tax on export profits for the first eight years; and most products manufactured in Eire enter the British market free of duty.

TITAN IN AFRICA

Work has started on the titanium oxide plant being built at Umbogintwini, South Africa, by South African Titan Products (Pty.) Ltd. This plant is expected to be completed by the beginning of 1962, will have a capacity of 10,000 tons a year and will cost in the region of £3m.

The contract for the complete factory has been awarded to W. J. Fraser and Company Ltd. This company will build in accordance with process designs and layouts supplied by South African Titan Products, which is owned by British Titan Products and African Explosives and Chemical Industries Ltd.



Montecatini's first venture into the US chemicals field will be when the company begins to manufacture polypropylene next year. A plant at Neal, West Virginia, will produce 25m. lb. of isotatic polypropylene. This artist's impression shows a general view of the plant, which will be run by Novamont Corp., Montecatini's wholly-owned subsidiary

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ICI

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Fluorinated Elastomers*

IMPROVED HEAT AND CHEMICAL RESISTANCE

TO cover fluorinated elastomers in a few pages, when so much has been published on the subject, is difficult, but here the problem is attempted of making a summary of the development of these products and the advantages they offer to the rubber industry. Generally speaking, the main advantages are their very good heat stability and good resistance to solvents and chemicals.

In order to establish the relationship of fluorinated elastomers to other rubbers, the limitations of the others are listed briefly. Natural rubber and SBR can be used up to 100°C., butyl, neoprene and polyurethanes up to 130°C. and hypalon and acrylate rubbers up to about 160°C.

The choice of fillers and vulcanization systems can improve the heat stability. In some cases the decomposition products of accelerators can have a beneficial effect (thiurams converted to carbamates during vulcanization). Peroxides produce C-C bonds which are less subject to reversion than sulphur linkages; vulcanization of butyl rubbers with resins gives added heat resistance, but the ultimate determining factor is the structure of the polymer chain. Double bonds, points of preferential attack by oxygen are usually the weak points. The heat resistance of neoprenes can be explained by the polar character of the chlorine atoms, which have a deactivating action on adjacent double bonds. Butyl rubber on the other hand owes its high temperature stability to its high degree of saturation, but thermal decomposition does occur under the effect of heat with the loss of isobutylene groups, this phenomenon being increased by the slight unsaturation associated with sulphur vulcanization. None of these rubbers can, however, be used above 200°C. — the realm of silicones and fluoroelastomers.

Considering for a moment the rubbers resistant to solvents and chemicals one must mention neoprene, hypalon, nitriles and above all organic polysulphides such as the solid and liquid thiokols. These, and particularly the first three mentioned, do not always have good enough oil and solvent resistance, and their thermal properties do not come up to the latest requirements of the aircraft and automobile industries. Silicones have poor chemical resistance.

Taken from a paper delivered by Madame G. Lamm, of the Research and Testing Laboratory of the French Rubber Manufacturers, at the Paris Conference in May.

Fluorinated Polymers

Fluorine is a plentiful element and occurs more abundantly on the earth's surface than chlorine. The first studies of polymerization of fluorinated olefines were made around 1930 and resulted in materials such as Teflon and Kel-F which were already in use during World War II. The fluorine atom being fairly large seems to prevent oxidation, and the C-F bond confers remarkable chemical resistance. The C-Cl bond is less stable and monochlorotrifluoroethylene therefore has inferior chemical resistance, but softens more easily and can be fabricated like other thermoplastics, which is not the case with Teflon. The thermal stability of both Teflon and Kel-F is due to the saturation. The highly symmetric molecule and the close approach of the chlorine atoms make the molecules of TFE and CTFE relatively rigid. Flexibility may be increased by introducing methylene groups which, as well as reducing the closeness of the atoms, also allows more bridging on vulcanization. This improvement can also be effected by copolymerizing unsaturated fluorinated or chlorofluorinated hydrocarbons with vinylidene fluoride.

Vinylidene Fluoride Copolymers

Research by US Army Quartermaster Research and Development Command in collaboration with M. W. Kellogg and Co. into low temperature rubbers resulted in the production of Kel-F elastomers. These are copolymers of monochlorotrifluoroethylene with vinylidene fluoride containing more than 50% of fluorine. Samples of these have been made freely available in France, and production of them will be underway by the end of this year.

Two rubbers, Kel-F elastomers 3700 and 5500 are being made at Etats-Unis by the Minnesota Mining and Manufacturing Co., polymerization being carried out in emulsion in the presence of redox catalysts activated by iron sulphate. The chemical resistance of these is not entirely due to the presence of fluorine, but also to the very high molecular weight which is of the order of 740,000 to 1,000,000.

X-ray studies have shown that Kel-F elastomers are amorphous down to −40°C. The two grades are chemically similar but 3700 is a general purpose elastomer, having good mechanical properties and high thermal stability added to high resistance to aromatic fuels, lubricants, solvents and mineral acids. Its resistance to low temperatures is better and its permanent set worse than Kel-F 5500. The latter has excellent resistance to fuming nitric acid, especially when co-vulcanized with Kel-F resins 800 and 820. These last two products are also high molecular weight polymers of similar composition to the elastomers, they are very thermoplastic in character due probably to the small proportion of vinylidene fluoride. 820 is of much higher molecular weight than 800.

Three Latices

Kel-F 200 wax is a low molecular weight polymer of monochlorotrifluoroethylene which is chemically resistant but which melts at about 100°C. and because of this facilitates processing of Kel-F elastomers, whose high viscosity is a drawback in all operations necessitating good material flow. Three latices are also available which are stable aqueous dispersions of the grades 3700, 5500 and 820.

The copolymers are less resistant to chemicals than the homopolymers, but some characteristics are common to all the materials.

1. Fair resistance to low temperatures and good thermal stability. They may be used from −50 to 200°C.

2. Very good resistance to aliphatic and aromatic hydrocarbons at high temperatures, making possible their use in contact with aircraft and rocket fuels.

3. Good resistance to silicate esters used in aircraft hydraulic systems.

4. Excellent stability to oxidizing acids, particularly Kel-F elastomer 5500/resin 820, having direct appli-

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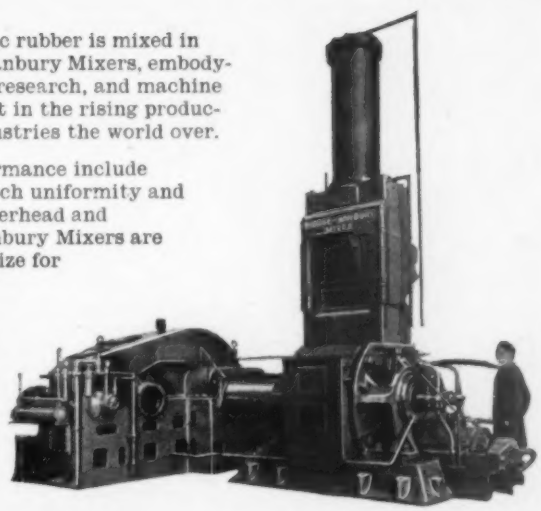

Fully detailed technical information is freely available on request.

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cation in rockets and aircraft using fuming nitric acid for combustion.

5. Impermeability to gases approaching that of the butyl rubbers and, like all the fluorinated elastomers, good resistance to micro-organisms.

6. One drawback is the attack by diester type lubricants used in aviation.

Silicon compounds such as Hi-Sil 233, X-303 coated or not in silicone oil are the best fillers for reinforcement because of their chemical and thermal properties. Some plasticizers such as di(2-hexyl) sebacate, dioctyl phthalate or tricresyl phosphate have a beneficial effect on the flexibility at low temperatures and give better resilience. These plasticizers, as is also the case with carbon blacks, have an affinity for free radicals, inhibit the action of peroxides and cannot be used in the presence of amines.

As regards manufacturing processes, Kel-F elastomers may be moulded, extruded and calendered with normal rubber processing equipment. Interior surfaces of extruders should be chromium plated or made of corrosion free alloys, and mould shrinkage is higher than all other rubbers because of the lower filler content, but the main processing difficulty is caused by the high viscosity and poor flow of the materials.

These are high cost speciality materials and small mixes are usual. Mixing should be continued for 20 minutes after all the filler has been added. This gives better flow in the mould, probably because of a thixotropic effect. Vulcanization is carried out in two stages, precure in mould at pressures of the order of 70kg./cm.^{2} followed by an oven cure. Compounds containing benzoyl peroxide are moulded at 150°C., those with hexamethylenediamine carbamate at 175°C.

Postcure for 5500 grade is about 16hr. at 150°C., 3700 16hr. at 180°C. Despite all precautions it is sometimes difficult to maintain exact dimensions in mouldings of Kel-F 5500 with resin 800, which are most resistant to strong oxidizing agents, as shrinkage occurs during oven cure. This, however, is accepted because of the excellent chemical and thermal properties. Kel-F elastomers extrude very easily. Adhesion to metals during vulcanization is obtained by the use of some silicone resins (Chemlok 607) and also with epoxy resins (Bondmaster M-618).

Hexafluoropropylene Copolymers

Another type of fluorinated polymer of industrial importance is a copolymer of hexafluoropropylene and vinylidene fluoride produced simultaneously by Du Pont under the name Viton and by Kelloggs as Fluorel.

These two rubbers are slightly different because of differences in polymerization technique and perhaps also because of differences in the production of the monomers. Viton A and AHV are made by copolymerization at 100°C. of an emulsion of vinylidene fluoride and hexafluoropropylene with the aid of redox catalysts. They contain 65% of fluorine. Methylene and difluoromethylene groups alternate with branched chain perfluorocarbons giving a structure very resistant to chemical attack, but very difficult to vulcanize. Both have the same formula and differ only in molecular weight and the physical properties dependent on it. Viton B, recently developed seems to be chemically modified, its viscosity is between A and AHV, compounds are more elastic, have better thermal stability, greater resistance to fluids and nitric acid and a better brittle temperature.

The Vitons can be used from −50 to 315°C., are resistant to aircraft fuels, diester lubricants, hydraulic fuels, phosphoric acid esters and long chain hydrocarbons, aliphatic and aromatic. They are also the most resistant of all the fluorinated elastomers to ionizing radiation. Vulcanization is the same as with Kel-F, namely β-rays, γ-rays, peroxides or polyamines. Acid acceptors are indispensable, as with all halogenated elastomers and one of the following must be used, magnesium oxide, zinc oxide, litharge or dibasic lead phosphite. Fillers have little effect on the thermal properties of the final product, most widely used are silicas and medium thermal blacks, the first particularly for use in peroxide cured materials resistant to chemicals, hot oils and dry heat, blacks for general purposes.

Compounding Vitons

The compounding of Vitons is relatively simple. They are compounded on a cold mill and after addition of all ingredients it is advantageous to allow the mix to stand overnight to assist dispersion. Cure is always done in two stages, moulding under pressure at 150°C. for 30 minutes, followed by oven postcure for 24 hours at 200°C.

Vitons may be moulded, extruded, calendered, coated onto textiles or stuck to metals. A Viton latex LD-242, 60% solids has recently been announced.

The network formation of Vitons has been studied in detail, and as it probably applies to the cross-linking of most fluoroelastomers it is worth quoting a few points here. The less vinylidene fluoride present the more difficult the copolymer becomes to vulcanize, indicating that the reaction is located in the CF_2 and CH_2 groups of the vinylidene fluoride. Vitons may be cross-linked by simple or blocked polyfunctional amines which decompose at high temperatures to produce the amines necessary for vulcanization, by di-imines derived from aliphatic diamines or aromatic aldehydes, by primary, secondary or tertiary monoamines, by a combination of a monoamine and a dithiol, by peroxides or by high energy radiation.

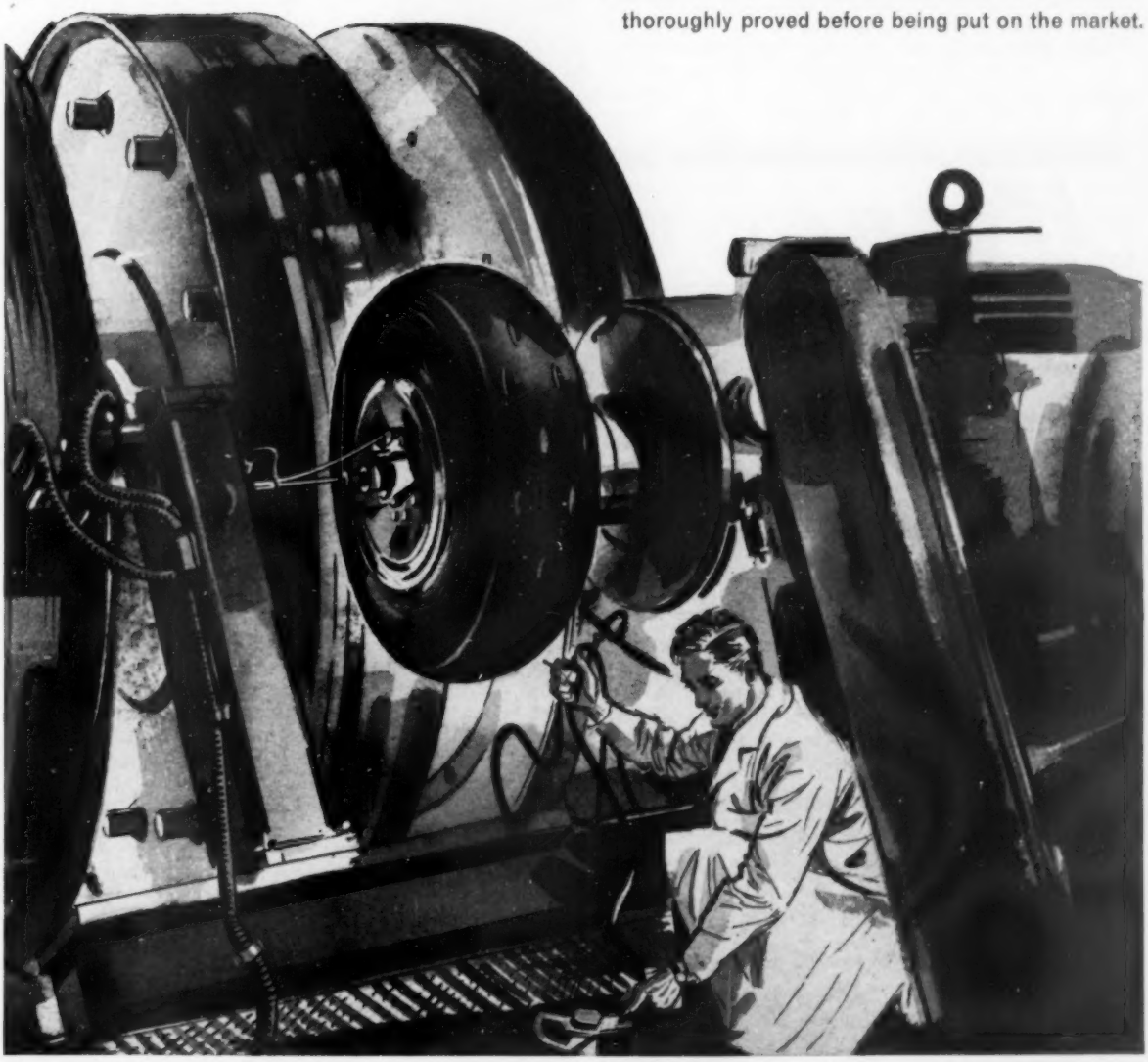
Reaction Processes

It was presumed that in the presence of a basic substance the HF was removed from two adjacent carbon atoms forming a double bond across which the amine was fixed, thus forming a bridge. A slightly different theory suggests that the cross-linking is achieved by simple alkylation through the labile fluorine. Experience always shows that the resilience of Viton at room temperature decreases as the rate of cross-linking increases, which suggests the formation of a three dimensional network by cross-linking accompanied by chain scission, the rate of scission increasing with vulcanization temperature.

The action of amines, di-imines, and dithiols is not fully understood but is believed to be as follows: Monoamines, having only one active group, produce double bonds which under the action of heat are transformed to conjugate bonds which react with double bonds in adjacent chains giving fluoro cyclohexenes and fluoroaromatic nuclei. These processes are slow and require high temperatures. With diamines, di-imines and dithiols double bonds are formed at random by removal of HF or by substitution of amine groups for fluorine atoms at relatively low temperatures. By the reaction with these double bonds under pressure and temperature, partially vulcanized polymers are obtained, bifunctional network forming agents acting between adjacent chains. It is not until the postcure at 200°C. in the oven that these conjugate double bond systems are formed by removal of HF from adjacent points of the double bonds formed in the previous stage, these unsaturated centres reacting again to form additional links resistant to temperature as with the monoamines. It is essential that the

PREVIEW OF PROGRESS

From tests made on this giant dynamometer, Dunlop scientists can accurately predict the performance of aircraft tyres in all operating conditions. In the illustration below a tyre's temperature is being checked after a trial run which has simulated the complete cycle of take-off, landing and braking. This testing of aviation equipment is typical of the care taken by Dunlop to ensure that all its products are thoroughly proved before being put on the market.



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Fluorinated Silicones

In 1951, the US Airforce, in a search for elastomers resistant to cold, heat and solvents, working in conjunction with Dow Corning Corporation, produced a fluorinated silicone — Silastic LS-53 which combined the excellent thermal properties of silicones with the chemical resistance associated with fluoroalkyls.

Considering their relatively short existence, silicones have many variations. The methyl groups have been partly replaced by phenyl, which, reducing the symmetry, gives better low temperature properties, and by vinyl groups which improve the compatibility with other rubbers and aid vulcanization.

General Electric announced in 1958 the development of silicone nitriles which had cyanoalkyl (methyl, ethyl or propyl) groups fixed to the silicone chain. The presence of these polar groups in place of 10-15% of the normal methyl groups, considerably improved the oil and solvent resistance and gave a very good retention of properties at low temperature.

Two grades of fluorosilicone made by Dow are available in France, Silastics LS-53 and LS-63. These can be used from −70° to 260°C., have very good resistance to oil, highly aromatic solvents and aircraft fuels. The difference between them is in their ease of use, LS-53 is difficult to fabricate and can only be moulded, but LS-63 can be calendered and extruded easily. They are supplied ready for use catalysed, LS-53 with benzoyl peroxide, LS-63 with 2,4,dichlorobenzoyl peroxide. Non-accelerated grades are also available, Moulding and curing cycles are similar to the other fluororubbers, one hour in the press at 150°C. and 24 hours in an oven at 200°C.

Other Products

There are other fluorinated elastomers referred to in the literature which have not yet reached Europe. These are the fluorinated polyester rubbers based on hexafluoropentamethylene adipate prepared from adipyl chloride and hexafluoropentane-diol. These have good rubber-like properties, they resist temperatures up to 205°C., have good retention of properties at low temperatures (brittle temperature −70°C.), swell only slightly in jet engine oils and have only very slight shrinkage in diester base oils at high temperatures. They are compatible with black and white fillers and can be vulcanized with peroxides.

The Pennsalt Chemical Corporation have recently brought out two fluorinated polymers, one a derivative of 1,1,2,3, tetra fluorobutadiene, and the other of heptafluorovinyl cyclobutene. Very little information on these products is available.

Applications

Fluorinated elastomers find applications in aeronautics where two types of performance are required. For supersonic piloted aircraft a rubber is needed with a long service life at temperatures from −55°C. to 205°C., in rockets the service life is short but temperatures are above 260°C. Fluorinated rubbers can be used for joints, diaphragms, pipes and tanks, where it comes in contact with aromatic fuels, diester lubricants, silicate and phosphate based hydraulic fluids and strong oxidizing agents such as fuming nitric acid and hydrogen peroxide.

The car industry and the chemical industry where pressures and temperatures are ever increasing find these materials of great interest. One drawback to these products is their high price. Nevertheless an interesting fact is that every new Douglas DC8 contains more than 15 kilograms of fluorinated elastomers.

For many years Air Force requirements have been for materials to withstand temperatures from −50 to 135°C., now the range is from −90 to 250°C. and very soon the requirements may be from −250 to 1000°C. or more. Fluorinated elastomers developed to meet present-day needs will soon be inadequate, the limits of the carbon-carbon bonds have already been reached, the small improvements which can be made by modifications to the accelerating and reinforcing systems are not really significant, and the elastomers of the future with greater heat resistance will be inorganic or semi-organic.

New Routes to Higher Temperatures

It is accepted that Russian research workers have already produced on a commercial scale, semi-organic polymers based on -Al-O- and -Ti-O-structures. Polyorganometalosiloxanes have also been made in Russia and these may be used as linings resistant to 500-550°C. Metals such as Ti, Al, B, C, Ni, Sn, are used as chain modifiers.

Phosphonitrile derivatives having a -P=N- grouping are worth considering and polymers made from phosphonitrile chloride $PNCl_2$, have been made in the UK but these are easily hydrolysed. Low molecular weight products with a phenyl grouping have been made which are stable at 500°C. and it is hoped that higher polymers of these or their fluorinated derivatives might prove of value.

Trimers of boron and phosphorus have been synthesized which are stable at 250°C., higher molecular weights are possible by replacing hydrogen with phenyl groups or halogens. The Minnesota Mining and Manufacturing Co. have made a polymer with a ~N-O-C~ chain from trifluoronitrosomethane and tetrafluoroethylene which contains no hydrogen.

It is difficult to foresee a system which will prove entirely satisfactory, but as the knowledge of chemical bonds, new polymerization catalysts to achieve higher molecular weights, is always increasing perhaps a totally unexpected solution may be reached.

New Rubber Depot

A large storage and distribution centre to serve the British Motor Corporation factory at Bathgate is to be built by the Dunlop Rubber Company on the outskirts of Whitbury, West Lothian, subject to planning permission. It will cover some 100,000 sq. ft. and employ initially about 200 persons.

Mr G. F. Whitby, a managing director of Imperial Chemical Industries' fibres division, has been appointed chairman of the division. Dr E. B. Abbot has been appointed a managing director.

All RAC motor-cycle patrols will eventually be equipped with this new sidecar made from glass-fibre-reinforced Bakelite polyester resin. It is being manufactured by Watsonian Sidecars, of Birmingham

C1

Expanding Scope for Natural Rubber

NRDB BECOMES NATURAL RUBBER BUREAU

IT is announced that the Natural Rubber Development Board has been renamed the 'Natural Rubber Bureau,' with effect from July 19.

The 1959 Annual Report of the Natural Rubber Development Board published this week records a further increase in world demand for natural rubber, 2,065,000 tons being consumed in 1959 compared with 1,957,000 tons in 1958.

The Report comments: '. . . the price remained at a remunerative level throughout the year. This was all the more significant in that synthetic facilities, particularly in the United States, are reported to have operated below their maximum capacity. This confirms opinions expressed in the past that the natural and synthetic polymers are complementary and moreover that the excellent general properties of the natural product are still essential to rubber manufacture.'

This current reorganizatiin of research and development work financed by the Malayan Rubber Fund, is taking place under the direction of Sir Geoffrey Clay, who was appointed Controller of Rubber Research in 1958.

Rubber in Roads

The Report records good progress in developing the rubberized road, commenting: 'in countries such as the United Kingdom . . . the emphasis is on limited-access high speed motorways, ring roads, by-passes and the like; in the less populated or less developed countries the requirement is for serviceable all-weather roads which can be cheaply constructed and maintained. Rubber has much to offer each type of highway, although it may well be that its most significant contribution will be to the low cost road. There are now comparatively few countries in the world without road sections of rubberized surfacing.'

A number of examples from overseas illustrate the marked economic advantages which can be gained by using rubber. In New Zealand, for instance, rubberized bitumen was applied in 1957 over a badly cracked concrete road 'at a cost of £2,500 per mile as compared with estimates for non-rubberized treatment of £11,000 per mile.' Latest reports show that this surfacing gives no sign of deterioration.

Regarding the increasing use of rubber in surfacings on airports, the Report comments: 'The runway, usually some 50 yards in width, seldom receives any rolling treatment from aircraft except along its centre line, and then only over part of its length. A result of heavy stressing and lack of rolling can be "crazing," and in the past few years considerable areas on five major Australian airports have been surface dressed with rubberized bitumen, either to remedy this trouble or as a measure to delay complete resurfacing.'

In the United Kingdom the research scheme in which the Board, the British Rubber Producers' Research Association and the British Government's Road Research Laboratory co-operate, continued. This was supplemented by work in the USA on methods of incorporating latex into bitumen. Further positive results were recorded. For instance, a report of the Road Research Laboratory, issued during the year concluded: 'Mastic asphalt in which natural rubber has been incorporated is more resistant to both cracking and deformation and generally gives a closer edge contact to the old asphalt surfacing. A mixture containing 15¼% of 25 pen. bitumen and 2¾% of natural rubber is giving good results after nearly five years.'

In Australia, a promising new process for preparing a rubber solution for road use from smoked sheet dissolved in power Kerosene was developed on an experimental scale.

This section of the Report concludes: 'Prospects for 1960 appear extremely good. In the United Kingdom rubber has been used in the new Birmingham inner ring road. In New Zealand several installations are projected including the airport at Dunedin, and the Malayan Government has announced its intention of expending approximately £100,000 on rubberizing 20 miles of roads. Numerous other highway authorities, already satisfied with the results of incorporating rubber, have announced their intention of extending their use of the material.'

NR in Engineering

Natural rubber, because of its versatility is being incorporated in a 'widening range of new projects' in engineering and building and these industries now consume 'a significant percentage of all dry rubber consumption.'

Examples of its use quoted are: dockside fenders, which 'in Australia alone account for an annual consumption of several hundred tons of rubber'; the extensive use of rubber waterstops in reservoirs; increasing use of rail pads under the British Railways modernization scheme (it is predicted that 1,000,000 will be used in 1960, the majority of natural rubber); 'the revolutionary all-rubber suspension' for BMC mini-cars; rubber suspension for railway and tube rolling stock; pneumatic air springs for road vehicles; rubber bearings for bridges.

Over 35,000 of the Board's technical publications for the building and engineering industries were distributed during the year.

Rubber in Furniture

In the furniture industry, too, rubber is finding increasing scope. The Report comments: 'In the United Kingdom, latex foam continues to hold its place as the pre-eminent quality material for upholstery purposes, but is meeting increased competition from the polyurethane foams in the cheaper lines. The situation is similar in the United States, where the Latex Foam Council, established by the Rubber Manufacturers' Association, has inaugurated a co-operative publicity scheme, which the Board is supporting.

'The advent of the new Pincore foam has succeeded in stimulating further interest in latex foam. Some aircraft companies, to whom weight is a criterion, are now experimenting with this new development as it combines quality with lightness. Although latex foam provides the biggest outlet for rubber in the furnished industry, the use of rubber webbing and rubberized hair is rapidly increasing. The idea of using rubber webbing was first put forward over a hundred years ago but it was not until recently that it succeeded in replacing steel.'

Nearly 24,000 of the Board's publications dealing with latex foam were distributed during the year and over 200 lectures were given.

The Report states that in the United Kingdom over half of the

Continued on Page 129

A CROWNING ACHIEVEMENT

CABOT'S exclusive new process—patents applied for—provides a new family of oil furnace carbon blacks with unique properties.

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CML 39-7959-'60

EXPANDING SCOPE FOR NATURAL RUBBER

Continued from Page 126

adult shoes have some form of rubber soles and heels and in the USA the percentage is higher still. This increased use of rubber is ascribed to: 'the development of the hardwearing resin rubbers utilizing either natural or synthetic rubber. Resin rubber has several times the life of leather solings, which it closely resembles in appearance and feel. Natural rubber is also preferred for the process by which soles are directly vulcanized to the uppers. It is estimated that some five million pairs were produced in 1958 by this method and that this figure increased to 7½ million in 1959.'

During the year the Board co-operated with manufacturers and raw material suppliers, through its membership with the Man Made Soling Association and publicized crepe soles internationally in conjunction with the Crepe Sole Association.

Increase in Technical Service

The section headed 'Contact with Manufacturers' reflects the importance of technical service to help the rubber manufacturer to choose the right rubber for the job and use it with the maximum efficiency. This is felt to be essential now that the range of rubbers available and the scope of rubber in industry is expanding so rapidly.

That this growing service fulfils a need is shown by the fact that in Australia alone some 300 visits were made to manufacturers and consumers in response to enquiries.

The report reproduces a graph showing the rapid increase in the production of Superior Processing rubber developed by the Natural Rubber Research organization and publicized by the Board throughout the world.

Including the periodicals 'Rubber Developments' and 'Natural Rubber News,' 281,000 publications were distributed, including 42 new or revised publications. The film 'South East Asia' was seen by over 16,000 people, and 'This is Rubber' by nearly 44,000. Both these films were shown 29 times on television.

TECHNICAL DEVELOPMENTS

Part of the work of Rubber Technical Developments Ltd., described in its 1959 Annual Report also published this week, was the evaluation of some of the new products recently developed in Malaya. These included 'SP sheet, SP brown crepe and the more recently introduced PA 80—a concentrated form of SP rubber which confers superior processing properties on all grades of natural rubber by blending in the correct proportions. The advantages offered by SP rubber for extrusion have been matched by PA 80, with the added advantage that increased proportions of PA 80 can be used to obtain further processing improvements with little or no loss in physical properties.'

More Scope for Non-woven Fabrics

Further work on rubber bonded non-woven fabrics resulted in the development of processing techniques making use of heat sensitive latex compounds to prepare a variety of different weights of fabric which do not exhibit the usual tendency to delaminate. Heat sensitive latex compounds have also been used to prepare 'consolidated heavy weight farbics of high rubber content and extreme flexibility, which may have wide uses in the shoe and allied trades.'

Research work was carried out during the year with the British Rubber Producers' Research Association to develop a continuous extruding process for low temperature resistant anti-crystallizing rubbers.

The programme for the year also included an investigation into the processing characteristics of low ammonia latices; the development of a new technique for obtaining fluid rubber compounds with better physical properties by means of depolymerization in the presence of certain reinforcing fillers; and a study of the fluid bed technique for vulcanizing rubber.

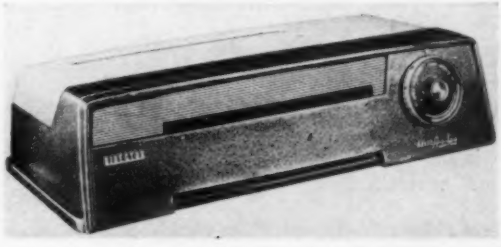
New Thermoplastic

TEMPERATURE AND CORROSION RESISTANT

PENTON is the trade mark of a new thermoplastic recently introduced by the Hercules Powder Company. Chemically it is a linear, crystalline, chlorinated polyether of high molecular weight which, unlike most halogenated polymers, is highly resistant to thermal degradation at moulding and extrusion temperatures. The material can be processed in conventional injection and extrusion equipment.

The mechanical properties show considerable differences between the new polymer and other thermoplastics. The heat distortion temperatures are high (up to 180°C.), and the retention of tensile and related properties at elevated temperatures is good, indicating its use where sterilization is required, in hot water equipment, valves, etc. The water absorption is extremely low (0.01%) and the dimensional stability under adverse conditions is good. Thi coupled with the electrical propertie place the polymer in a class on its own electrically. While the loss factor is such that it cannot be classified with PTFE, polystyrene or polythene, it is certainly superior to most other thermoplastics, especially under wet conditions or over wide temperature ranges.

The chemical resistance of penton to both inorganic and organic agents is outstanding. Its workability permits the ready fabrication of valves, pump parts, pipe and sheet. These factors and the high heat distortion temperature make possible its use for applications where it has previously been necessary to use high cost materials, and penton is finding wide acceptance in the United States as a material for tank linings, pipe fittings and coating applications generally where corrosive conditions prevail. A penton tank liner 40 mils thick can provide corrosion resistance at temperatures up to 250°F., and adhesion of the liner to the tank can be satisfactorily achieved by using a neoprene type adhesive.



This photocopy machine has a 32-oz. housing injection moulded in Cycolac ABS resin, made by Borg-Warner Corp., whose UK agents are Anchor Chemical. It is in two colours—one is incorporated in the resin, while the other is lacquered on

MEN *and* MATTERS

A Review of People and Events

by Peter Richards

DR E. R. ROWZEE, president and managing director of Polymer Corporation Ltd., and an international authority on synthetics, recently received the first R. S. Jane Memorial Lecture Award from Dr E. Gordon Young of Halifax, outgoing president of the Chemical Institute of Canada. The award was established this year by the CIC Chemical Engineering Division in memory of the late R. S. Jane, a noted Canadian chemical industrialist.

It is presented to a Canadian for exceptional achievement in chemical engineering or industrial chemistry. The lecture will be delivered by Dr Rowzee at the Canadian Chemical Engineering Conference in Quebec City, November 7-9.

Dr Rowzee and other polymer scientists in Canada are already preparing for the next Macro Molecular Symposium, which will be held in Montreal next year. The host organization of this largest annual meeting of polymer scientists will be the Canadian High Polymer Forum. Chairman of the symposium will be Dr C. A. Winkler.

American Letter

This week's issue sees the resumption of an old feature — American Letter. It will appear monthly and is contributed by Norman Hewitt. Mr Hewitt has been connected with the polymer industry for nearly twenty years. He got his first job with a rubber firm immediately after graduating from Princeton in 1941.

After working in the wire and cable field for five years as a chemist, and an interlude in the Chemical Corps, he joined Foster D. Snell, the New York firm of consulting chemists and engineers, as consulting rubber technologist.

Off-duty — he works four days a week for Snell — when he's not being consulted about a variety of technical problems, he likes to consult the flowers in his small azalea nursery.

Dunlop Again

Something like 100,000 people are reported to have watched the British Grand Prix at Silverstone on Saturday last. To those who follow the sport the result is now well known; Jack Brabham added more points to his healthy lead in the world's champion racing driver stakes, and Dunlop tyres again came home ahead of all others. Dunlop really have an astonishing record in motor racing and also, of course, in absolute land speeds, the company's tyres having been used for every British world speed record since 1957, and we have almost entirely monopolized this 'event.' They will again be used on Donald Campbell's new car for his world speed record attempt in September to beat the existing 394mph record also set up on Dunlop tyres.

Guid Nychburris

At the annual Guid Nychburris (which my old Scots nannie tells me means Good Neighbours) Festival held at Dumfries, this year's tableau by the North British Rubber Company was a follow-up to their 1960 Teenage Promotion for Keds Casuals by harnessing the popularity of the BBC television programme 'Juke Box Jury.'

Within the comparatively compact area of the vehicle platform, as seen from my picture, the atmosphere of the 'Juke Box Jury' was realistically portrayed with compere and panel of four — all from the Heathall factory personnel. Juke Box, the appropriate signature tune and pop records were featured, while the idea of the Keds Top Twenty was cleverly interpreted by colourful casuals mounted against a background of record sleeves. This contribution to the tableau was created by a small group at the Dumfries factory of North British.

Fibre Movements

Changes have been announced in I.C.I.'s Fibres Division. Dr Alfred Caress, chairman since its formation in 1956, has been appointed a director of I.C.I. G. F. Whitby, a managing director of the division, has been appointed chairman in succession to Dr Caress, and Dr E. B. Abbot has been appointed a Fibres division managing director.

Dr Caress is 56 and a native of Bedfordshire. He joined I.C.I. in 1928, and served first with the company's Billingham division and then with its plastics division, whose board he joined in 1936 as research director. He served both as development director and joint managing director of this division before being appointed, in 1951, the first chairman of the newly-formed 'Terylene' council, charged with the considerable task of commercial production and development of I.C.I.'s new polyester fibre.

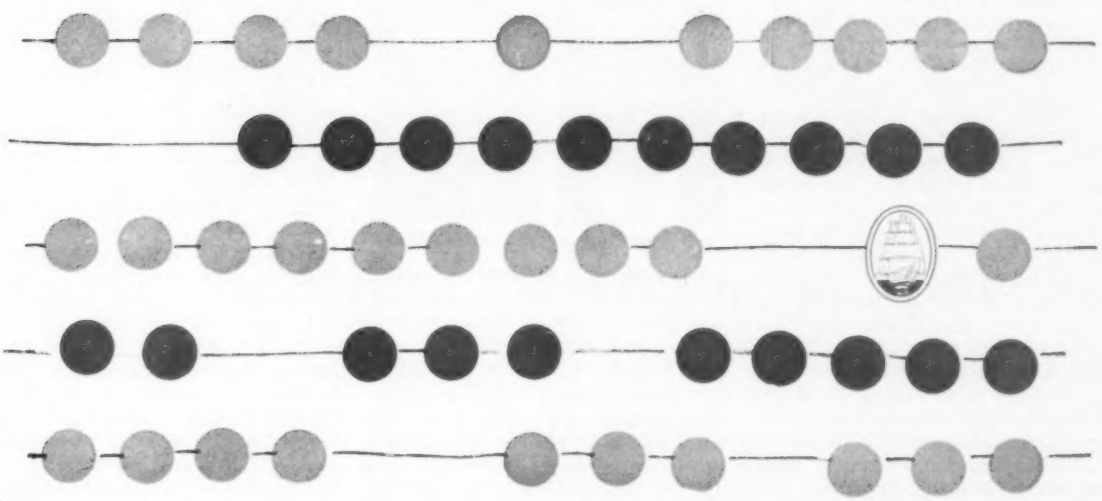
In 1956 the 'Terylene' council was absorbed into the company's newly-created fibres division, of which Dr Caress was appointed chairman.

Mr Whitby has been with I.C.I. since 1934. After a post-war period as assistant to the I.C.I. technical director, he was appointed deputy chief engineer at Wilton Works. He became a member of the 'Terylene' council on its formation in 1951 and was appointed joint managing director in 1954. In 1956 he became a managing director of the Fibres division.

Dr Abbot joined the dyehouse

The North British Rubber Company's contribution to Dumfries Festival

beads you can count on...



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CONSTANT WEIGHT/VOLUME RATIO—makes for easier measuring

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department of I.C.I. dyestuffs division in 1936, and remained with the division until 1951, engaged on a wide range of technical service activities — with particular reference to dyestuffs and organic chemicals and their application to textiles. During this period, Dr Abbot made extensive visits to all parts of the world. He was appointed Technical Service member of the 'Terylene' council in June 1951.

International Research

Considerable interest has been expressed in the series of features published from time to time in *RJIP* on the work of organizations carrying out research for the rubber and plastics industries. The three so far published have dealt with organizations in this country, Holland and Israel. Others to follow in due course include, I understand, accounts of research in France, Germany and, again, the UK. Interestingly enough, the article on the Rubber Research Association of Israel, published in last week's issue, resulted from a holiday visit to Israel by Miss C. H. Chenhalls. Miss Chenhalls, who is, of course, the secretary of the FBRAM, visited Technion City, on the slopes of Mount Carmel outside Haifa, to obtain material for the article. She tells me she was most impressed with development there, and the beauty of Mount Carmel. Research wallahs, whatever else they may do, certainly seem to have an eye for beautiful surroundings, with views very much better than the usual city street.

Goodyear Changes

Goodyear (GB) Ltd. have made two important executive changes in their industrial products sales organization.

W. U. Chapman, who has for the past 16 years been manager of the industrial products department, has

J. T. PEARSON

W. U. CHAPMAN

been transferred to the export sales division of the company — he will deal with specialized industrial products export matters.

J. T. Pearson succeeds Mr Chapman and brings a varied financial, organizational and commercial engineering experience to this appointment. He served with the RAF during the war, and after the war as a regular with Technical Training Command at Cranwell College. He joined Goodyear in 1953, and during his career with the company has been responsible, as a sales engineer, for the Goodyear industrial brake programme and for special industrial technical assignments within the manufacturers' sales division.

Liaison

The Programme Liaison Committee of the Plastics Institute, the Plastics and Polymer group of the SCI, OCCA and the IRI has held its first meeting. This committee has been formed to act as an information group on polymers and related subjects, and to co-ordinate the programme planning of the various bodies.

A list of conferences and major meetings planned for the next three years has been prepared, and this getting together of the various bodies should prevent some of the clashes that have occurred in previous years.

* * *

Samuel A. Moore, new general chairman of the Reinforced Plastics Division of The Society of the Plastics Industry Inc., has begun his two-year term of office as of June 1 1960. He is manager of the Commercial Resins Department of the Finishes Division of the Interchemical Corporation, Cincinnati, Ohio.

* * *

A. J. Ashe is the new manager of business research of The B. F. Goodrich Company, Akron.

Question Corner — 127

(Second Series)

452. What causes 'beading' when coating paper with polythene, and how can it be remedied?

(Answer next week)

Answer to Question Corner — 126

451. In blown film extrusion the molten resin enters the die, either through the bottom or the side, and is forced round a mandrel inside the die, shaped into a sleeve, and extruded through the ring-shaped die opening in the form of a rather thick tube. The tube, while still in the melt state, is expanded to a bubble of desired diameter, and corresponding reduced film thickness: this is done by air pressure admitted through the centre of the mandrel. The bubble is extruded and pulled upward. Occasionally it is pulled in a downward or horizontal direction.

The blown bubble is closed by the die at the bottom and by pinch rolls at the top. Inside, the air is maintained at constant pressure to ensure uniform film width and gauge.

Factors affecting film gauge, such as extruder output, take-off speed, barrel and die temperature, must be very strictly controlled. Control of the quantity and direction of the air which cools the film is also extremely important. The width of the die opening — *i.e.*, the position of the mandrel within the die — must also be well adjusted so as to obtain uniform film gauge.

The so-called 'frost line' is the ring-shaped zone where the bubble reaches its final diameter and first appears frosty because the temperature of the film has fallen below the softening range of the resin. The height of this frost line above the die is also an important factor as a measure for controlling orientation of the melt in the machine and transverse directions, and some physical properties of the film such as tear strength. The frost line must always be as level as possible.

(Another question next week)

Polly Ester Says . . .

'Bulk factor — vital statistics'

1. F. P. Hiron (London). 2. A. Tomkins (Midlands). 3. J. Everson-Davis (Western). 4. T. S. Kirkby (Yorkshire). 5. P. Bosworth (Southern). 6. L. G. Stubbs (Scottish). 7. J. Kenyon (North-Western). 8. S. Griffiths (South Wales and Monmouthshire). 9. G. Bell (North-Eastern)

Plastics Institute Chairmen for 1960/61

NEW chairmen of the sections of the Plastics Institute were recently elected at annual general meetings which were held throughout the country. Brief biographies of the chairmen are given below.

F. P. Hiron *London*

F. P. Hiron was born in London in February 1917. He got his degree at University College, London, and carried out research work on reaction kinetics under Professor C. K. Ingold for his Ph.D.

After joining the Ministry of Supply in 1939 — where he was concerned with the testing of paint and plastics — he went in the RAF in 1942; trained as a Navigator and reached the rank of Flight Lieutenant.

He has been with the Shell group since 1946; and worked for Shell research at Thornton research centre in Cheshire for nine years on many investigations, mainly concerned with the use of resins in plastics and paint.

In December 1955 he was transferred to the newly-built Egham technical service laboratories and has been in charge of technical service work connected with Epikote resins. He became deputy to the manager of these laboratories in October 1959. He joined the Plastics Institute on transfer to London in 1955 and was elected to the London section committee in 1958. He is also a member of the IRI and the SCI.

The secretary of the London section is C. W. Oakhill.

A. Tomkins *Midlands*

Mr Tomkins is chief chemist to the Lucas Group; but having worked in earlier times on hard rubbers and thermosetting compounds, he has retained a lively interest in plastics and their applications.

Lectures that he has delivered before the Midlands and other sections of the Institute have appeared in 'Transactions.' He has also served for many years on the Moulders' group of the British Plastics Federation, and is a member of BSI's Plastics Industry Standards Committee. In 1958 he led the UK delegation to the ISO/TC.61 meetings in Washington.

He believes that the social activities of bodies like the Institute can too easily acquire a commercial flavour: because of his views on this subject he was a founder-resignee from the Midlands section two years after its inauguration, only rejoining in 1953. He now considers that the Institute's stature has grown with its expanding influence in educational and technical matters.

The secretary of the Midlands section is C. B. Zealley (I.C.I.).

J. Everson-Davis *Western*

Educated at Aldenham, Mr Everson-Davis joined the South Eastern Division of I.C.I. in 1928 and was concerned with sales of chemicals until 1935 when he was appointed outside representative based at Peterborough. His war service included more than three years spent in the Belgian Congo.

In 1947 he was transferred to the plastics department of the Southern region situated at that time in London. He was appointed area sales manager for plastics in the South Western area in 1953, the headquarters of which is at Bristol.

Apart from gardening, Mr Everson-Davis is a keen fly fisherman and indulges in both oil and water colour painting.

The secretary of the Western section is G. Honeyborne (Permali Ltd.).

T. S. Kirkby *Yorkshire*

Mr Kirkby, who is 46, spent the first ten years of his working life in the motor trade, going through all sections of a very large main agent. He became a member of the Institute of the Motor Industry in 1937. This was followed by a period of training in production engineering.

Throughout the war he was with the Ministry of Supply as an executive technician on armoured fighting vehicle production. In 1946 he started his own business with a staff of two, producing simple fabrications in Perspex. This business has never stopped expanding over the past fourteen years, and now produces almost anything that can be made from the thermoplastic range of sheet, tube, and block.

Mr Kirkby has been a member of the Institute since 1947, and has been on the Yorkshire section committee

for the maximum permissable period, including a short period as secretary.

The secretary of the Yorkshire section is A. Smith (British Belting and Asbestos).

P. Bosworth *Southern*

Dr Bosworth graduated in 1949 from Birmingham and after three years in the Chemistry research school at Birmingham studying high polymers, was awarded a Ph.D. in 1952.

His first post was in the Royal Naval Scientific Service and he worked for more than three years in the rubber and plastics section of the Admiralty materials laboratories.

In 1956 he joined Leicester, Lovell to work on the development of synthetic resins for adhesives and plastics, and was appointed chief chemist in 1958.

The secretary of the Southern section is Mrs. C. E. Williams (Leicester, Lovell).

L. G. Stubbs *Scottish*

Mr Stubbs was educated at King Edward VI High School, Birmingham, and joined I.C.I. in 1935. He was transferred to Glasgow three years later. Most of his war service was spent with the Royal Artillery in the Middle East, and when he rejoined I.C.I. after the war he became representative for plastics materials working from the Glasgow office of the Scotland and Northern Ireland region.

He joined the Scottish section of the Institute in 1946, and took over as secretary when R. W. Eastaugh died suddenly a few months later. Mr Stubbs was vice-chairman in 1958.

The secretary of the Scottish section is K. Manock (Geigy Co.).

J. Kenyon *North-Western*

Mr Kenyon entered industry as a student of engineering, rubber and plastics technology followed by staff apprenticeship in tool design and plastics engineering, firstly with the Orb Engineering Company and, with the exception of the war years, from 1939-1949 with Ferranti Ltd.

During the war he served with the RAF on operational flying duties in Europe and the Far East.

In 1949 he joined Universal Metal Products Ltd. on the technical sales staff and after subsequent promotions leading to sales manager was appointed general manager of the Plastics division in December 1958. He has represented the company on most committees of the British Plastics Federation and has always been an active member of the Plastics Institute in the North-West. Particularly interested in technical education in the plastics industry, he has been a member of the joint advisory board for rubber and plastics education at Newton Heath Technical College for several years.

The secretary of the North-Western section is C. Pollard (Geigy Co.).

S. Griffiths *South Wales*

Stanley Griffiths was born in Cardiff and educated at the Royal Masonic School, Bushey. He has been associated with the plastics industry since he joined Minerva Laboratories (Instruments) Ltd., twenty-eight years ago. He became a director of that company in 1959, and he is also a director of the associated company, Plastics Engineers Ltd.

He has been actively concerned with the South Wales and Monmouthshire section since 1953 when he was elected to the committee and has successively served as treasurer, secretary, and vice-chairman.

The secretary of the South Wales section is S. D. Eagleton (Monsanto).

G. Bell *North-Eastern*

George Bell is technical service manager of Resinous Chemicals Ltd., and has been active in the plastics industry for fifteen years.

He is a firm believer in technical service as an important aid to the ultimate sale and believes that the prime function of a technical service unit is to install confidence in the customer and prove that his company's products will give every satisfaction.

Before joining RCL, Mr Bell was employed in the research and certification department of A. Reyrolle and Co. Ltd., testing and developing the further use of plastics in electrical switchgear.

He is a keen caravanner and photographer.

The secretary of the North-Eastern section is R. A. C. Kuenzli (British Paints).

I.C.I. to Make Polyvinylidene Chloride Co-Polymers in the UK

The Plastics Division of Imperial Chemical Industries Ltd. is installing a plant to manufacture polyvinylidene chloride co-polymers, and expects the first members of a range of products to be available in production quantities early in 1961. There is a considerable demand in the UK for these resins in solvent solution and as aqueous dispersions for coating purposes. They have a high degree of impermeability to moisture, grease, odours and gases and can provide heat-sealing properties. They will be of great value in those trades where paper, cellulosic and thermoplastic films are used for packaging. In the past the UK demand has been met almost entirely by imports.

Triphenyl Phosphate

Geigy have announced a reduction of the price of triphenyl phosphate by £13 a ton. The price goes down from £379 a ton (in 10-ton lots) to £366.

Estimated sales of Dunlop rubber underlay in 1960 will be in the region of 8m. sq. yd. — 20% of the total market.

Phillips Increase Polybutadiene Capacity

AN increase of 5,000 long tons a year in production capacity of its new 'cis-4' polybutadiene rubber is announced by the Phillips Chemical Co., wholly owned subsidiary of Phillips Petroleum.

This expansion of the company's Borger, Texas, synthetic rubber plants is an addition to the 20,000-ton a year cis-4 plant now being constructed, and results from strong demand for the new rubber.

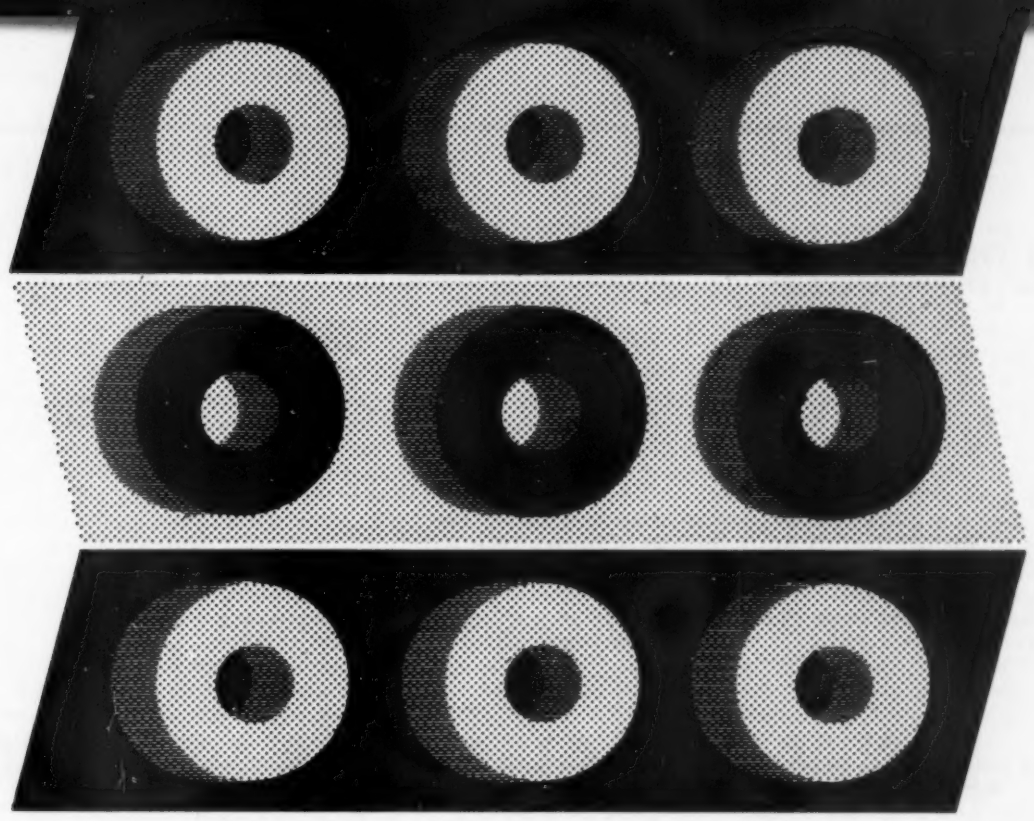
Phillips has licensed its cis-polybutadiene synthetic rubber process to two companies in USA and one in Italy. Other companies are seeking licences. The company claims that cis-4 has outperformed natural rubber in truck and passenger car tyre tests, totalling millions of miles in the past three years, and adds that this performance has been confirmed by extensive tests conducted by several tyre manufacturers.

Phillips expects to have this 25,000-ton per year plant in full operation in the fourth quarter of this year.

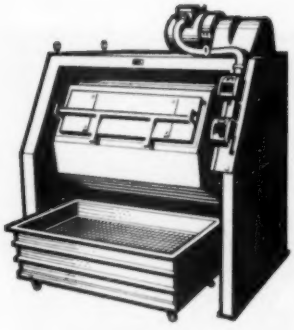
Cast Polythene Film

Peter Dixon and Son, the papermakers, has opened a new plastics department, producing cast polythene film using the latest American equipment. Commercial quantities, the first in the UK, are expected to be available at the beginning of September.

Produced in a Home Counties factory, the new British film will be supplied in rolls to widths and gauges now currently demanded for side-weld bag-making machinery and for flexographic and other printing processes.



Solve those de-flashing problems with '**DRIKOLD**' in the Columbian International sub-zero tumbler.



When small rubber components are frozen with 'Drikold'—I.C.I. solid carbon dioxide—in a rotating drum, flashes become brittle and break off with the tumbling action. Sub-zero de-flashing with 'Drikold' will increase production—for instance, complete multi-cavity mouldings can be tumbled to produce clean components efficiently and economically. I.C.I. Technical Service staff are available to advise on your problems, and will de-flash sample batches on request.

Sub-zero tumblers are obtainable from
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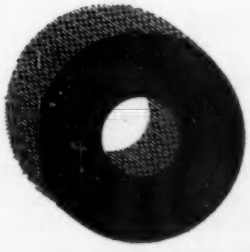

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AMERICAN LETTER

News of the US Rubber and Plastics Industries

*from Norman L. Hewitt**

IT is rapidly becoming evident that most major producers of SBR will soon offer either polyisoprene or polybutadiene — or both — together with the regular grades of the butadiene-styrene elastomer. Latest announcements come from Shell and Goodyear.

First in the commercial production of polyisoprene, Shell will have increased their capacity at Torrance, California, to 20,000 tons/year by this fall and a 40,000 ton capacity midwest plant will be ready next year. The Goodyear polyisoprene (Natsyn) will be manufactured at Beaumont, Texas, in a new factory to be ready in 1961. Polybutadiene (Budene) will also be made at this facility. Phillips Chemical will produce not only a cis-polybutadiene (20,000 tons starting this fall) but also a balata-like trans stereoisomer. This is now under test in golfball covers. Other companies about to enter the 'synthetic natural' market are Firestone who have a facility of 30,000 tons of polybutadiene to be on stream late this year, and Goodrich - Gulf with 25,000 tons of both isoprene and butadiene types scheduled for 1961.

Footwear

A most unusual statistic concerning footwear markets for the first quarter of 1960 has appeared. For the first time in history imports have exceeded domestic production — 30.8m. pairs imported to 28.2m. pairs produced in the United States. The source of most of these imports is, of course, Japan. Since 1957 Japanese annual shipments have mounted from a modest 7m. to the current tidal wave of 121m. pairs. There is one mitigating factor in that many of these imports are actually sandals — the famous Zourries, which consist only of a cellular sole and toe straps. This type is not a large item in US production.

However this may be, the footwear industry has decided to petition the Tariff Commission to impose restrictions on these imports. Labour and management have combined in this action. Meeting with Governor Saltonstall of Massachusetts in which is located a large segment of the rubber footwear industry were W. E. Brisner, president of Tyer Rubber, and representatives of B. F. Goodrich and US Rubber, as well as union and RMA officials.

One does not have to search far afield to find evidence of the imports. With the first days of summer, stores along New York's Fourteenth Street displayed sidewalk tables containing hundreds of pairs of Zourries—at an average price of 50 cents per pair. Although the low price is made possible by cheap labour, it is certainly not accurate to say that the sandals themselves are of poor quality. Analyses have shown that the cellular compounds contain at least 50% rubber hydrocarbon as a blend of natural, SBR and reclaim. The pastel shades would reflect credit on any company proud of good workmanship and quality.

New York Rubber

At the end of the third week of May 1960, the employees of the New York Rubber Corporation of Beacon, New York, left their 109-year-old factory for the last time, as manufacturing operations in one of the country's oldest mechanical goods works stopped — abruptly and permanently. Negotiations for sale of the entire property and associated companies to the Acme-Hamilton Company of Trenton, New Jersey, have been substantially completed. Creditors of the company agreed to accept 40% payment of their accounts. The purchaser has not indicated any plans to reopen the factory, and it is unlikely that the venerable name of New York Rubber will again be encountered in the industry.

Some of the company's 250 employees have found employment with the neighbouring Chemical Rubber Company and the Du Pont factory in the city of Newburgh, both makers of coated fabrics; but the bulk of the disengaged must move further afield.

New York Rubber Corporation began operations in New York City, but remained there only long enough to justify its name. In 1852, one year after its founding, the company moved some 60 miles north to the Hudson River town of Beacon. Here, on the bank of the turbulent Fishkill Creek, on a site a half mile in length but no more than 200ft. wide, the manufacture of belting, hose and other mechanical items was begun. A memento from that pioneer day still exists in the form of a letter from Charles Goodyear instructing that certain patent royalties be paid to his brother. Other remnants of this era include the water wheel and its stone approaches, and the draught - horse stable which later became the locker and shower room.

From the beginning, the specialty of New York Rubber was conveyor belting, and for a long period this company was the acknowledged leader in its field. Technical improvements fell behind, however, so that it was only within the past few years that development work on the newer heat-resisting elastomers was started. In the face of much impressive evidence of technological achievement, it was somewhat disappointing to find a contrasting deficiency in recording these achievements. When one considers the years of meeting and solving the problems of compounding and design that were represented in this company's existence, it is indeed sad to see them all gone and forgotten.

Many of the company's older friends trace the origin of the decline of its fortunes to the years of the Second World War. At that time of industrial recasting, government officials made strong recommendations — almost to the point of duress — that large-scale production of inflatable rubber products such as liferafts be undertaken. This was undoubtedly profitable during a time when the production of anything was profitable. However, the decision to continue in this field to the exclusion of familiar mechanical goods, in the light of subsequent entry of smaller, cost-cutting firms, was questionable. The *coup de grace* fell two years ago when a long strike sapped almost all cash resources. New investment was dissipated in an unsuccessful new factory in Swainesboro, Georgia. Typical of this operation was the construction of an inadequately ven-

* *See Men and Matters page* 130.

tilated building. In the fierce heat of a Georgia summer, the problem of adhering coated fabric seams with a blend of rubber cement and perspiration was disastrous.

Edward Upton and William Rudko, both men of considerable experience in the rubber industry, took charge of the company late in 1959, but their efforts were unavailing. New York Rubber was only one of almost 1,500 rubber companies in this country, but its position as a direct link with the times of Charles Goodyear gave it a unique meaning in American industry.

New Name in Polypropylene

Although there are reported to be at least seven companies engaged — or about to engage — in the manufacture of polypropylene, the first and most often heard name in this field has been that of Hercules' Profax. Now the Enjay Chemical Division announces Escon, a polypropylene newly in production at Baytown, Texas, at the rate of 40m. lb. per year. Plant construction and operation is by Humble Oil and Refining Company and the sales will be by Enjay who have shifted status from a subsidiary of Esso Standard Oil to a division of Humble. The Standard Oil Company of New Jersey remains as the parent of all. Enjay has a sales force of about 75 who are responsible for lubricating oil, solvents, gasoline additives, butyl, Vistanex and Buton coating resins — in addition to polypropylene. Last year they accounted for most of Jersey Standard's petrochemical sales of $256m.

The research in back of Escon cost Standard $15m. and involved basic work on catalysts. The relation of the Escon process to those of Phillips and Ziegler is not yet clear. However, the product appears to be equal to other polypropylenes in respect to such well-known qualities as high temperature resistance (150°C.), low water absorption and generally excellent physical properties. In regard to the high temperature properties of polypropylene it is interesting and enlightening to note the statements of Westinghouse engineer R. R. Dixon who questioned the reported use of this plastic in a structural component at 220°F.:

> 'I was astounded by this statement. At 66psi stress ASTM distortion values are reported typically as 205°-230°F. in the literature.
>
> 'It should be generally recognized that an ASTM distortion or deflection temperature is certainly not a design limit at a given stress. Creep would be a severe problem at such elevated temperatures. If Mr Levy had a part operating at 220°F., it was either for a very short time or the stress (including moulded-in stress) must have been quite low. The implication that polypropylene is useful as a structural material at 220°F. could lead to many misapplications and is unfair to plastics suppliers and potential users.'

Mr Levy replied:

> 'The part in question is in service under pressure at the temperature stated for extended periods of time.
>
> 'As you realize the ASTM heat distortion test is no design criterion since it confounds a combination of creep and flow with changes in modulus of elasticity with temperature. A better design guide would be a stiffness temperature curve and a creep equation both of which are available in the literature.
>
> 'In the case cited, since the material was required for electrical reasons and there was no adequate substitute, the part was designed with a rather sophisticated approach based on the data mentioned which were valid since 220°F. is far enough removed from the crystalline melting temperature to make the creep equation apply, and the part is currently in service.'
>
> —S. L.

Uses for polypropylene are steadily growing in three basic areas of film, mouldings, and fibres. AviSun Corp. recently announced a decrease in their film price to 70 cents per lb. The major use for polypropylene film is in the bread industry as package overwrap, but even here the challenge to cellophane remains tentative. The most promising market envisioned by William Naden, vice-president of Humble, was building materials. Although this is a long range look it seems that polypropylene with its extremely low specific gravity and raw material costs will come closer than most plastics to this long-scught goal.

Tyres

Scarcely a day passes with no reference to new advances in tyre cord and longer lasting tyres. Now Goodyear is reported to be testing a high temperature resisting polyamide cord. It melts at 600°F. which is 118°F. higher than the melting point of regular nylon. Du Pont manufactures the new fibre under the name of HT-1 which is descriptive if not original. The company have devoted none of their usual elegant advertising display to HT-1 as yet and have expressed doubt that it will prove economical as a tyre material. (This statement possibly reflects Du Pont's previous failure to persuade tyre makers to adopt their Adiprene polyurethane to produce tyres of super performance.)

Stories of the miracle tyre which outlasts the car are always current. There is little question that a number of these tyres have actually been made and tested with satisfactory results, that is, 100,000 miles of service. For example Goodrich is reported to have made such tyres on the regular production line. (Nor were these based on Estane, the Goodrich polyurethane elastomer.) But in all instances the decision appears to be 'not economical.'

If we were to let our imagination wander unhampered by economics we should certainly turn to a newly-announced group of inorganic fibres now quoted at $10 to $12 a lb. They are made by Horizons Incorporated of Cleveland from alumina and other oxides and show tensile strengths of 400,000psi at 4.750°F. (glass is rated at 200,000psi).

The latest communique in the battle between rayon and nylon tyre cord comes from Du Pont's disclosure that it plans to double its nylon yarn capacity for cord at the Richmond, Virginia, high tenacity yarn facilities. When construction is completed in late 1961 the new capacity of 100m. lb. per year will be produced by a low cost process which yields superior yarn. This step is one of many in the steadily descending price scale of nylon. (Foster Grant of Leominster, Mass., and Allied Chemical recently announced a price of $.98 for nylon 6 moulding resin.)

Undoubtedly rayon cord faces an ever-increasing loss in its price advantage. Perhaps this has motivated the proposed merger of Beaunit Mills Inc., a producer of Tyrex rayon cord (60m. lb. per year) with Hercules Powder Co. Whatever the causes in this interesting rumour it is certain that the ebb and flow of fibres will be of high interest to the rubber industry for a long time to come.

The American Scene: Elastomer Education

Although there is no analogue in America to the National College of Rubber Technology, there are available a substantial number of graduate courses and symposia devoted to polymer matters. Chief among these is the annual intensive course for scientists and engineers given in a

one-week period at the University of Akron. Entitled 'The Chemistry and Physics of Elastomers,' it is sponsored jointly by the Institute for Rubber Research and the Department of Chemistry.

The fifth edition of this programme was presented during the week of June 13 to a group of 18 relatively young chemists and technologists representing some 13 companies in the polymerization, rubber manufacturing, and rubber chemical fields. Professors Morton, Bueche, and Stephens of the University, and Dr Scott of Goodyear combined to lead a daily eight hours of lectures and laboratory sessions on such topics as emulsion polymerization, oxidation, vulcanization, the kinetic theory of rubber elasticity, dynamic properties, temperature - time superposition of creep curves, and several aspects of the reinforcement of elastomers.

In his discussion of elasticity and physical properties Dr Bueche made a lasting impression on both technologists and chemists with an illustration taken from the tensile shortcomings of GR-S (no one referred to this elastomer as SBR). This elastomer in its most usual form contains a large proportion of very-low-molecular-weight material. Not only do these 'low ends' contribute nothing themselves to tensile strength, but they also require a high degree of cure (cross-linking) to obtain a minimum of network structure in the vulcanizate. This excessive cross-linking decreases network chain length. According to some tensile theories, chain length is (for a certain range) inversely proportional to tensile strength. Therefore, unreinforced GR-S vulcanizates will rarely be high-strength materials.

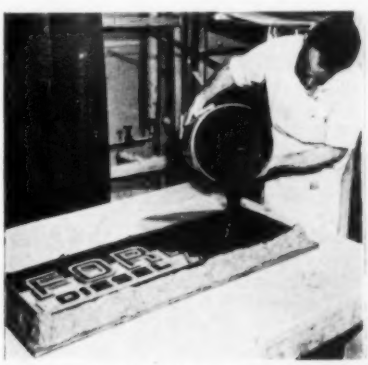
Now comes a logical question: Why is GR-S made in a manner which results in inferior properties in non-reinforced compounds? Only because lower chain lengths mean easier processing, which is to say, faster production. Here is a situation where the technologists have commanded the chemists. In Germany, with a similar elastomer, a higher tensile material was made at the expense of processability. There the chemists gave the orders. Although this is indeed a tempting basis for economic (not to mention sociological) generalization, it is probably wisest simply to recall that in the United States the largest consumers of GR-S are also the principal producers.

There is another aspect to the Akron course which goes beyond the pleasure of mental stimulation in an academic environment. This is the matter of opportunity for organized advanced technical education. In most industries these opportunities just do not exist. Perhaps the word 'advanced' is ill-chosen. 'Basic' is the better word, not only to describe the Akron course, but also to state the need of the industry. How often have those who read the comments of the examiners for the IRI Licentiateship seen the phrase 'insufficient grasp of fundamental principles.' The pressures and strains of manufacturing for profit tend to displace technology by expediency, and fundamental principles languish in the ivory tower. But this is only a blind alley off the road that has led Rubber Technology from art to science. Occasional exposure to academic discipline and the detached study of basic elastomer behaviour are gravely needed. The University of Akron and its Institute of Rubber Research have seen the need and given an answer.

Polysulphides for Moulds

USED BY FORD AT STYLING CENTRE

POLYSULPHIDE rubber compounds have helped to solve problems arising in the studios and shops of Ford Motor Co.'s styling centre in America. Ford has been using the compounds for more than a decade, primarily for making moulds. But Ford stylists and engineers have also taken advantage of the properties of polysulphide rubber compounds to develop some important innovations.



A polysulphide mix is poured over a clay model as the first step in the production of a name plate in Ford's styling centre in Dearborn, Michigan

In mould-making it has been found that one important advantage of polysulphide rubber is the degree of control the user has over the quality of the final mould. By regulating the proportions of polysulphide and the catalyst in the mix, and by adjusting curing time, the moulds can be made hard, soft or even medium.

For mould-making the centre uses FMC 201, a polysulphide rubber material formulated by Smooth-On Manufacturing Company, Jersey City. This material is poured over a clay model and allowed to set, generally for about four hours. A plaster cast is built to maintain the shape of the mould, and it is covered with a parting agent to prevent sticking. An epoxy resin surface coat is then applied and allowed to set for an hour.

The final step in the fabricating shop is the lamination of a glassfibre part to be taken from the mould. This involves the application of a glassfibre cloth cover with a laminating resin. After setting for several hours, the formed glassfibre is removed for use on a clay, plaster or glassfibre car model in the styling studio. It frequently is plated so that it looks exactly like a production component in metal.

Perhaps the greatest advantage of polysulphide rubber compounds, according to Ford styling fabricators, is the fact that they can reproduce the original clay component exactly. For example, after the polysulphide has set over a clay model, the mould can simply be bent away in order to be removed. This is particularly important in the reproduction of reverse angles. A polysulphide mould can be removed in one piece. A plaster mould, on the other hand, would have to be cut away in order to remove it from any awkward angles and later rebuilt as closely as possible. As a result, the use of plaster would involve multi-piece moulds.

In the centre these compounds are formed to simulate floor mats, window mouldings and crash padding on styling prototypes. The only precaution necessary is the application of a water base paint or a polyvinyl acetate emulsion for sealing off before using lacquers or vinyl paints.

A new tyre tester from B. F. Goodrich of Akron, Ohio, incorporates a multi - channel oscillograph which automatically record a tyre's reactions as it is steered on a spinning ten-foot-road wheel.

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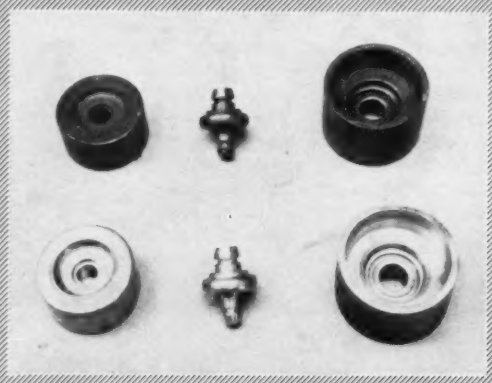

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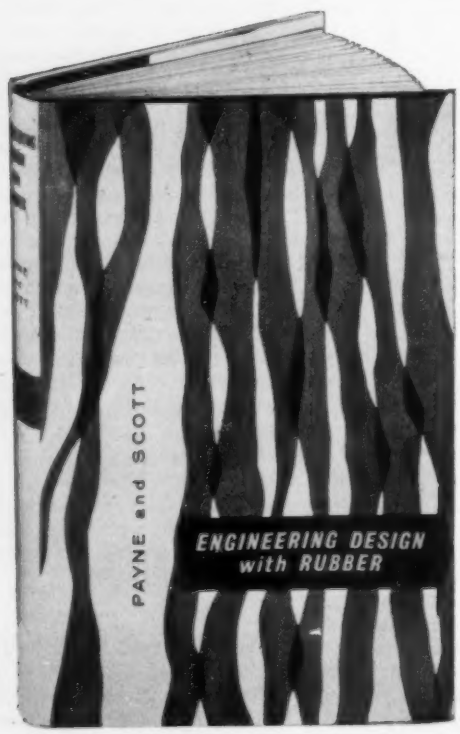

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German Rubber Conference

DKG PROGRAMME IN BERLIN

THE International Rubber Conference, organized by the Deutsche Kautschuk-Gesellschaft Wissenschaftliche Vereinigung den Kautschuk-Chemiker und-Ingenieure, will be held, as earlier reported, in the Kongresshalle, West Berlin, October 4-8. After the ordinary general meeting of members on October 4, the Congress will be opened by the president of the DKG on October 5. The lecture programme is as follows:

Plenary Lectures

Development of synthetic rubber since 1930, by P. Baumann, Marl-Hüls. Development of man-made fibres for technical uses, by A. Ebert, Wuppertal-Elberfeld. In the chair, G. Fromandi, Leverkusen.

Elastomers I

Diene Rubber: A linear polybutadiene, by G. Alliger, B. L. Johnson and L. E. Forman, Akron, USA. Development and importance of polybutadienes, by F. Engel, Marl-Hüls. On ethylene - vinylacetate - copolymers and their cross-linking, by H. Bartl and J. Peter, Leverkusen. Rubber-elastic properties of ethylene-propylene-copolymers, by G. Natta, G. Crespi and M. Bruzzone, Milan, Italy. First use of a new highly elastic ethylene-propylene-polymer, by C. Canevari and A. Morando, Milan, Italy. Butyl and its uses, by G. Klotsch, M. Langhack, W. C. Smith and R. L. Zapp, of New Jersey, USA. Electron - microscopic studies on the micromorphology of elastomers, by Th. G. F. Schoon, Würzburg. In the chair, O. Giese, Fulda.

Man-made Fibres

Some relations between static and dynamic properties of tyre cords, by G. Kemmnitz and G. Espanion, Cologne. Carrying out of measurements on tyre cord in rubber, and the evaluation of the results, by J. K. van Wijngaarden of Arnheim, Holland. Modern Viscose Tyre Cord in Tyres, by F. B. Breazeale, of Enka, USA. A new dielectric method for quickly determining moisture content of tyre cord, by E. Haase-Deyerling and H. Neumann, Hannover. Nylon in Tyres, by H. G. Lauterbach, of Wilmington, USA. Methods of testing and evaluating cord twine fatigue in tyres, by Z. Bartha, of Budapest, Hungary. In the chair, E. Pieper, Wuppertal-Elberfeld.

Vulcanization I

October 6: Kinetics of heat-curing of synthetic rubber, and the influence of additives, by W. Scheele, Hannover. Studies on the activation energy of vulcanization, A. Franck, K. Hafner and F. W. Kern, Munich. Sulfur Group Analyses in Natural Rubber Vulcanizates. II. Application to Mecaptobenzothiazole Accelerated Stocks, by M. L. Studebaker, Akron, USA. On the initial stages of a scientific research on natural rubber, by F. Kirchhof, Neulussheim. The diffusion of sulphur S 35 in rubber, by H. Auler, Aachen. Possible uses of the polarograph in the rubber laboratory and special methods of analysis for clarifying vulcanization processes, by F. Mocker and I. Old, Höechst. Vulcanization of ethylene-propylene-copolymers with peroxides, by E. Di Giulio and G. Ballini, Ferrara, Italy. In the chair, C. Brünger, Hannover.

Testing I

The modulus and resilience of polymers in gum and black loaded states and the effect of temperature, frequency and amplitude of deformation on these properties, by D. Bulgin, G. D. Hubbard and H. Schilling, UK. The dynamic properties of black loaded polymers at amplitudes of deformation below 1%, by D. Bulgin and T. Lamming, UK. New methods for testing rubber vulcanizates, by R. Clamroth and R. Ecker, Leverkusen. New studies of abrasion based on the Dunlop - Lambourn principle by D. Beckmann, Fulda. On the relation of elastic constants of high-polymer substances to temperature, by F. W. Backes, Munich. Methods for cold-testing high polymers, by O. Umminger, Marl-Hüls. IR hardness, microhardness and Shore hardness, by F. Händler and P. Kainradl, Vienna, Austria. In the chair, W. Stegemann, Hannover.

Special Tyre Subjects

Improved Tyre Performance with Synthetic Rubber, by A. Loulan, Akron, USA. Cord Paths in Tyres, by V. E. Gough, Birmingham, UK. Further studies on measurements of deformation with extensometers on tyres during inflation and rolling by F. W. Kern, K. Hafner and H. Nippold, Munich. The Origin of Tyre Squeal, by R. F. Miller and J. G. Slaby, Brecksville, USA. The Radial Stiffness of the Pneumatic Tyre, by D. H. Cooper, Birmingham, U.K. In the chair, W. Kraemer, Hanau.

Elastomers II

On the quantitative infrared-spectroscopic determination of rubber isomers, by T. Kimmer, Schkopau. The identification and quantitative determination of elastomers in rubber, by H. Feuerberg, Berlin-Dahlem. Measurements of specific and latent heat in rubber, by F. H. Müller, Marburg. Capillary-rheometry as a method for predetermining behaviour of Neoprene during processing, by C. C. McCabe, N. N. Mueller and E. K. Ott, Wilmington, USA. Determination of small quantities of monomers in Latex, by J. Brodsky, Gottwaldov, Czechoslovakia. In the chair, W. Klein, Marl-Hüls.

Fillers and Vulcanization II

October 7: Reinforcement of natural rubber by carbon black and high-energy radiation, by A. Lamm and G. Lamm, Paris, France. Studies on the reinforcing effect of fillers in vulcanizates, by F. Glander, Hannover. On the relation between the physical and chemical structure of a silica and the rubber-technological properties, by W. H. Albrecht, Düren. Role of carbon structure in the reinforcement of rubber—The effects of lowered structure, by C. W. Sweitzer, Princeton, USA. Experience with rubber containing carbon black, by P. Bernemann, Marl-Hüls. Vulcanization of natural and synthetic rubber by resins, by C. Thelamon, Paris, France. Phenol resins as curing agents, by A. Giller, Wiesbaden. In the chair, D. Schmidt, Frankfurt.

Technology and Production

Researches into productivity measurement in the rubber industry, by W. C. Wake, Shawbury, UK. On helical flow in extruded goods, S. Eccher, Milan, Italy. Mechanical strength of conveyor belt specimens in relation to defined flaws, by A. Matting, Hannover. An economical method of producing latex foam, by A. Sila and J. Leveque, Paris, France. Properties of vulcanizable systems of rubbers and thermoplastics, by Ch. L. Bryant, Welwyn Garden City, UK. New principles for calculating properties of rubber V-belts, by K. H. Bussmann, Berlin-Dahlem. In the chair, H. Hellwege, Munich.

Ageing

Oxidative stress relaxation studies of radiation-cured vulcanizates, with and without antioxidant, by J. R. Dunn, Welwyn Garden City, UK. Antiozonants in oil-plasticized rubber, by Th. Kempermann and R. Clamroth, Leverkusen. Ageing behaviour of butyl vulcanizates, by D. C. Edwards, Sarnia, Canada. Oxidation of Unsaturated Elastomers, by E. M. Bevil-

Continued on page 143

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Plantation Share Survey

WHAT price rubber plantation shares now? This must be the problem facing investors at the moment. Since about mid-June the 'spot' rubber has lost around 9d. per lb. although the drift has recently shown signs of having grounded. The setback has been heavier than expected by most of the experts. Even so the adjustment in the commodity level is not at all an unmixed blessing. It certainly provides no ground for tossing aside the good shares at the drastically low points now prevailing.

On present appearance profits for the current year probably should still be higher than in the past 12 months while with 1961 rubber saleable at around 30d. per lb. that year should also be a remunerative one for the well run groups. The International Study Group figures for the first four months to April indicate some deterioration in the position of natural rubber *vis-a-vis* synthetics. Compared with last year, production of natural during the period has increased slightly to 630,000 tons from 620,000. Although world consumption is estimated to have exceeded output by 45,000 tons, the total of 675,000 contrasts with 690,000 in the same period 1959. On the other hand world consumption of synthetics not counting the Iron Curtain countries is put at 582,500 compared with 505,000 tons in January-April 1959.

For the first half of 1960 the average 'spot' rubber is now a little over 36d. per lb. compared with 27d. per lb. during the corresponding period of a year ago. The situation so far as current earnings are concerned therefore provides no real warrant for the sharp setback that has occurred in share values especially in same of the less marketable issues. The present average yield basis with dividend earned from 30d. per lb. rubber is in most cases very generous indeed and it is clear that the position in the share market discounts a further heavy setback in the price of the commodity. The fact that the natural rubber share of new rubber consumption—particularly of latex — in all the principal manufacturing countries is declining obviously suggests that the prevailing price level is still too high. Nonetheless, general consumption prospects are healthy enough to imply that the present position reflects an unduly austere view of earnings and dividend at any rate for the Malayan producers.

Consumption of natural rubber in USA in May amounted to 41,200 tons which showed a slight reduction from the April total. It brought the January-May aggregate to 222,900 tons which contrasted with 229,500 tons in the similar period of a year ago, and represents a further reduction from 35% to 32.2% in the share of the American market. In comparison USA consumption of synthetics in the first five months of this year increased further from 427,000 tons to 468,300 tons. The high price of natural latex is having an appreciable effect upon sales of the Eastern product in the American market. Consumption of this type has fallen from 32,000 tons to 23,750 tons in the first five months of this year.

DUFF DEVELOPMENT, largest of the Kelantan rubber producers, report that output in 1959 improved from 4,754,000lb. to 4,847,000lb., net sale proceeds averaging 26.2d. per lb., equivalent to about 28¼d. on a London basis against under 21d. in 1958. Estate costs jumped from 15.7d. to 18.8d. per lb. including 3.3d. against 1.9d. for export duty. From the profit of £142,100 the taxation charge amounted to £46,000 and the 50% dividend absorbed another £71,200. In addition £49,200 net was spent on replanting of 502 acres, replanting of 196 acres and maintenance of immature areas. This year's programme covers the replacement of 233 acres old rubber and the opening of a further 561 acres of reserve land. Already, capitalization of the planted areas is among the lowest in the industry at £24 5s. per acre while net liquid assets taking into account recent land sales and the special payout from the resulting profit, stand at the equivalent of approximately £20 per acre.

HONGKONG (SELANGOR) RUBBER announced a same again dividend of 90% in spite of the fact that profits were moderately lower at £16,800. After providing tax charges the net distributable profit amounted to £11,200, of which shareholders received a total of £6,202 by way of dividend. Replanting and new planting expenditure totted up to £2,900. In 1951 and again six years later, the issued capital was reduced by cash return of 50%, resulting in the present abnormally low basis of only a little more than £14 per acre of rubber. The position is being normalized by a free scrip issue of 300% from reserves. This will be effected by converting each 1s. share into two shares of 2s. par value. On the new basis, the capital costs will stand at the more usual level of approximately £56 per acre. The financial position of the group is quite sound, net liquid assets of £17,000 or over £21 per acre of rubber being supplemented by trade investments figuring at a balance sheet cost of £19,200. These consist of interest in group rubber and tin companies and provided gross dividends of £3,851 during the past year. It would appear that their real value exceeds the book cost.

A year ago BATU TIGA (SELANGOR) RUBBER completed the sale of an estate and from the proceeds stockholders have received cash distributions of around 13s. 4d. on the former £1 units. Of the latest payment 4s. was in respect of capital and lucky holders now have in place of each original £1 unit eight 2s. units. The dividend of 25% paid for 1959 is on the smaller capital. It contrasts with an equal of approximately 22% in the previous year. Admittedly the improvement is relatively modest but it must be remembered that output in 1959 was appreciably reduced following the sale of the estate. In fact it declined from 2,917,000lb. to 2,192,000lb. but sale proceeds jumped by about 5d. to 25.8d. per lb. while estate costs including 4d. for export duty, rose by less than 1d. to 16.8d. per lb. The resulting profit of over £80,000 goes against £66,300 and fully covers outgoings such as taxes, dividend and replanting. The remaining seedling area of 897 acres is to be replaced with modern material by 1965. Last year the old rubber yielded 603lb. per acre compared with 1,100lb. from the pedigree stock which has yet to reach the limit of its productivity.

In recent years holders of KAMPONG KUANTAN RUBBER have done very well in the matter of scrip issue. Three years ago they were given three shares on a one-for-two basis and a similar amount of 20% preference. Again this year their holdings were doubled by a 100% hand round of ordinarys. In spite of this the present capital basis is by no means out of the way at the equivalent of £53 per acre of rubber in ordinary and £9 per acre in preference.

GERMAN RUBBER CONFERENCE

Continued from page 141

acqua, Wayne, USA. The mechanism of ozone cracking of rubbers, by A. N. Gent, Welwyn Garden City, UK. In the chair, W. Scheele, Hannover.

Elastomers III and Testing II

The effect of piperidine on rubber solutions, by A. Soininen, Helsinki, Finland. Variability in synthetic rubber supplies, by C. J. Hael and M. G. Peakman, Birmingham, UK. The distribution of foreign matter in natural rubber supplies, by M. G. Peakman, Birmingham, UK. Tensile strength of styrene-butadiene-rubber vulcanizates, reliability and variations of measurements, by W. May, Delft, Holland. Influence of the thickness of test vulcanizates on the tensile strength values measured by the ASTM standard method, by D. I. Nazeni, Bogor, Indonesia. In the chair, P. Stöcklin, Leverkusen.

On the morning of October 8 a number of films will be shown. Other events include a technical visit to the Federal Institute for Material Testing and a comprehensive ladies' programme.

Rubber Statistics

WORLD POSITION AT END OF APRIL

PRELIMINARY details of the world rubber situation up to the end of April last have now been released by the Secretariat of the International Rubber Study Group. In the following table are shown the production and consumption totals for natural rubber for the first four months of the year, compared with those for the same period of 1959 (in 1,000 long tons):

NATURAL RUBBER

	April 1960	Jan.-April 1960	Jan.-April 1959
Production ..	152.5	630.0	620.0
Consumption ..	160.0	675.0	690.0
		Change since Jan. 1, 1960	
Stocks at April 30:			
In producing areas ..		240.0	– 15.0
In consuming areas ..		240.0	+42.5
Afloat		195.0	– 35.0
		675.0	– 7.5

According to the Study Group, the April consumption total includes estimated imports into the USSR of 1,750 tons, and into China of 21,000 tons. These imports bring the totals for these two countries to 25,500 tons and 70,500 tons respectively for the four months, representing some 15% of total world consumption during the period; during the same period last year, their imports totalled 105,500 tons.

Synthetic Rubber

The synthetic rubber position is set out in the following table:

SYNTHETIC RUBBER

	April 1960	Jan.-April 1960	Jan.-April 1959
Production ..	157.5	647.5	502.5
Consumption ..	142.5	582.5	505.0
		Change since Jan. 1 1960	
Stocks at April 30 ..		332.5	+22.5

As may be seen from the above table, production of synthetic has increased by some 30% compared with last year, while consumption has increased by only some 20%, stocks having risen from 250,000 tons a year previously to the present figure of 332,500 tons, or about 30%.

US General Position

The US Department of Commerce has now issued the following preliminary statistics for the month of May (in long tons):

NATURAL RUBBER

Consumption:

41,263 tons of which latex 3,655 tons.

Stocks:

82,693 tons of which latex 15,214 tons.

SYNTHETIC RUBBER

	Production	Consumption	Stocks
S-Type ..	102,501	77,423	188,808
Butyl ..	9,814	5,602	16,014
Neoprene ..	11,401	6,471	14,243
N-Type ..	3,088	2,497	8,267
	126,804	91,993	227,332

Total new rubber consumption during May amounted to 133,256 tons, compared with a total of 132,284 tons for April, and brought the figure for the first five months of the year to 691,184 tons, an increase of 35,000 tons compared with the same period of last year. Of the May total, natural rubber accounted for 30.97% compared with 31.77% for April.

BOOK REVIEW

PLASTICS PROGRESS 1959: PAPERS AND DISCUSSIONS AT THE INTERNATIONAL PLASTICS EXHIBITION.—Edited by Phillip Morgan. Pp. xii + 216. (London: Iliffe and Sons Ltd.) Price 55s. net.

This books presents the text of the technical papers read at the International Plastics Convention at Olympia in June 1959. The texts given in the book are considerably longer than the versions which were presented at the convention itself and the review of the discussions which followed them is also included. Also included is a survey from experts in Europe, the United States and the United Kingdom, of recent thought in the glass reinforced plastics field.

Subjects of the papers dealt with in the book are as follows: Polypropylene: Physical and mechanical properties of polypropylene—The moulding characteristics of polypropylene. Material developments: Some new epoxide resin systems and their properties—Cross-linking of thermoplastics after fabrication—Some theoretical and experimental aspects of block and graft copolymers. Recent developments in glass reinforced plastics: Progress in the Benelux countries—Progress in Germany—Progress in the United States—Progress in the United Kingdom. Expanded plastics: US developments in foamed plastics—Bulk density and physical properties of expanded polystyrene. Extrusion: Extrusion studies of thermoplastics—The extrusion of acrylics.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Fuel Consumption

It has been pointed out that there was some ambiguity in the report in last week's report on the new Dunlop Elite tyre, in which it was stated that the slight increase in rolling resistance improved the fuel consumption. The improvement, of course, would be from the point of view of the petroleum manufacturers. From the motorist's angle, fuel consumption would obviously be slightly increased.

Patent Specifications

The following information is prepared from published Patent Specifications by permission of the Controller of H.M. Stationery Office. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, W.C.2, at 3s. 6d. per copy (including postage).

Chains of Synthetic Material

No. 830,567. Kettenwerke Schlieper GmbH. Application and Filed, November 4 1957. Application in Germany, November 5 1956, September 28 and October 9 1957. Published, March 16 1960.

The links of a chain are formed of fibrous material, preferably glass or quartz fibres, bonded together by a hardened synthetic resin such as a polyester. The links may have a casing of synthetic resin which is free from fibres, PVC being the preferred material for the casing when a polyester is used for bonding together the fibres. Manufacture of the links involves treating the fibrous material with the synthetic resin in liquid or plastic form and winding the fibrous material in an annular mould having a peripheral slot, the mould enclosing a space corresponding in shape to the shape of the link to be made and engaging the link previously made. It is stated that the object of the invention is to produce a chain having great tensile strength and having considerable resistance to wear as well as low frictional resistance at the points where the individual links are in frictional contact with each other.

Shorter Abstracts

Polymer Compositions. 830,827. Imperial Chemical Industries Ltd. Filed, January 13 1958.—A composition comprises polythene of specific gravity greater than 0.93 containing up to 30% of crystallizable polypropylene, not more than 80% of the polypropylene being insoluble in diethyl ether when boiling at atmospheric pressure.

Dental Prostheses. 830,840. Farbenfabriken Bayer A.G. Filed, May 16 1957.—High molecular weight thermoplastic carbonates derived at least in part from dihydric phenols are claimed for use in the production of dental prostheses.

Irradiated Polythene. 830,899. General Electric Co. Filed, June 6 1956. — Irradiated polythene is stabilized against oxidation in air, particularly at elevated temperatures, by incorporating in the polythene, before irradiation, a small proportion of symmetrical di-β-naphthyl-*p*-phenylenediamine.

Deterioration Retarders. 830,914. Manufactures de Produits Chimiques du Nord Etablissements Kuhlmann. Filed, May 17 1957.—Nickel xanthates are claimed as atmospheric deterioration retarders for natural and synthetic rubber.

Inking Rollers. 831,012. United States Rubber Co. Filed, April 25 1957.—Inking rollers are made of a non-porous polyester polyurethane having a Shore 'A' hardness of 5 to 35 and being free from plasticizer.

Rubber Markets

LONDON

After a downward adjustment of prices, reflecting lower Eastern basis, values rallied slightly on reserve of sellers against short-covering orders. Switching of Terminal positions featured the market. Factory demand remained small. Prices again eased sharply following further heavy Eastern liquidation. Nearby rubber was in only small request and went to a discount from current shipment.

Latest prices are as follows:
No. 1 RSS Spot: 30½d. nominal.

Settlement House:
August 30⅝d.-30⅞d.
September 30½d.-30¾d.
October/December 30¾d.-31d.
January/March 30½d.-30¾d.
April/June 30½d.-30¾d.
July/September 30d.-30½d.

No. 1 RSS cif basis ports:
August 30¾d.-31d.
September 30¾d.-31d.

Godown:
August 105⅞ cents nominal.

LATEX

Centrifuged 60% latex per gallon in drums, seller, July, September, October, December, 18s., cif European ports. Spot, seller, 18s. 6d. Bulk, nominal, d.w. 17s. 11d. August. Creamed, seller, nominal, 17s. 8d. September, October. Normal, seller, August, 15s.

BANGKOK

No. 1 RSS

The price of No. 1 RSS at Bangkok on July 18 was 35.50 (37.50) US cents per lb.

SINGAPORE

Overseas advices were mixed on July 18 and the market opened slightly below the previous levels. There was early selling at the lower levels but thereafter the market steadied throughout the morning on sellers' reserve. There was no interest in lower sheets and factories were very quiet. In a quiet afternoon session there was little inclination to trade. Slight interest in lower sheets was reported. After hours, the market continued quiet.

	Malayan cents per lb., fob Malayan ports to open ports	
	July 18	Prev. Close
No. 1 RSS, Aug.	110½–110¾	109⅝–110
Sept.	110⅝–110⅞	109⅞–110¼
No. 2 RSS, Aug.	109¾–110¼	108½–109½
No. 3 RSS, Aug.	109 –109¼	107½–108½
No. 4 RSS, Aug.	106½–107½	106 –107
No. 5 RSS, Aug.	103½–104½	103 –104
No. 1 RSS, Spot	109¼–110	109⅜–110
No. 3 blanket thick remilled crepe, Aug. ..	103½–104½	102½–103½
No. 1 fine pale crepe, Aug. ..	119½–120½	119 –120
2x thin brown crepe, Aug. ..	101½–102½	100¾–101¾

Tone: Quiet

The Industries Syndicate quote latex, native produce, 60% centrifugal, packed in rectangular drums, fob at 210.00d. per gallon.

CEYLON

No. 1 RSS

The price of No. 1 RSS at Colombo on July 18 was 124.5 (123.5) Ceylon cents per lb.

NEW YORK

The New York rubber market ruled as under on July 18:

DEALERS' PRICES

	US cents per lb. ex-dock	
	July 18	Previous
No. 1 RSS, August	38¾a	41¾a
Sept. ..	38½a	38½a
No. 2 RSS, August	38½a	41½a
Sept. ..	38a	38½a
No. 3 RSS, August	38½a	41½a
Sept. ..	37½a	38a
No. 1 RSS, Spot ..	Unquoted	Unquoted
No. 3 amber blanket crepe, October ..	34¾n	34¾n
No. 1 latex thin crepe, August ..	41¼n	41¼n
No. 1 latex thick crepe, August ..	41n	41n

FUTURES—REX CONTRACT

	Closing	Prev. Close
July ..	42.75b–43.25a	42.40b–42.95a
Sept. ..	38.20t	37.85b–37.90a
Nov. ..	37.25t	36.90b–37.00a
Jan. ..	36.65b–36.85a	36.40b–36.55a
March ..	36.30b–36.50a	36.20b–36.30a
May ..	35.80b–36.00a	35.70b–35.85a
July ..	35.40b–35.70a	35.30b–35.50a

Sales: 53 Tone: Steady

Rubber futures were firmer on July 18 on short covering. Some positions advanced by about ¼ cent per lb. Dealings were moderately active. Physical rubber was very steady but quiet. In late dealings profit-taking pared the earlier gain in futures.

AMSTERDAM

The Amsterdam rubber market ruled as under on July 18:

	Guilders per kilo	
	July 18	Previous
July	3.13	3.16
August	3.12	3.15
September	3.11	3.14
July/Sept.	3.12	3.15
October	3.08	3.08
November	3.07	3.07

Sales: Nil Tendency: Quiet

DJAKARTA

The market was quiet on July 18 and the turnover was small. Sheet No. 1 was quoted at 38 to 38.50 rupiahs per kilo.

	Rupiahs per kilo	
	July 18	Previous
Spot No. 1 priok ..	37.25b	38.00b
Spot No. 2 priok ..	36.25b	37.00b
Spot No. 3 priok ..	34.75b	34.50b
No. 1 fine pale crepe, spot	34.50b	34.50n

Tone: Quiet

Crop Returns

Unless otherwise indicated the figures quoted, to the nearest thousand lb., represent crop returns for the month stated and for the number of months of the planting company's financial year to date. Corresponding figures are given in parentheses.

RUBBER ESTATE AGENCY

May

Kuala Lumpur.—606 (593). 8 mths—5,086 (5,118).
Jeram.—302 (314). 8 mths—2,433 (2,299).
Tamiang (Malaya).—57 (77). 8 mths—545 (583).
Sungei Kahang.—154 (168). 8 mths—1,216 (1,125).
Bandar Sumatra.—73 (82). 10 mths—870 (985).
Batu Kawan.—58 (67). 9 mths—545 (548).
Buntar.—107 (105). 5 mths—522 (488).
Kepitigalla.—59 (45). 2 mths—88 (76).
Langkat Sumatra.—78 (60). 5 mths—373 (353).
Sungei Bahru.—124 (106). 11 mths—1,399 (1,148).
Tambira.—94 (87). 11 mths—1,207 (1,156).
Tanjong Malim.—359 (395). 11 mths—3,792 (3,889).
Sennah.—128 (114). 5 mths—691 (664).
Amalgamated Rubber.—41 (31). 5 mths—207 (167).
Java Rubber.—94 (90). 5 mths—466 (450).
Soember Ajoe.—20 (20). 8 mths—135 (224).

THOMAS BARLOW

May

Bradwall (FMS).—151. 5 mths—662 (569).
Chersonese (FMS).—63. 5 mths—315 (267).
Highlands and Lowlands.—1,938. 5 mths—9,076 (8,795).
Krian.—5. 5 mths—26 (36).
Sungei Krian.—160. 5 mths—782 (707).
Muar River.—425. 2 mths—740 (745).

COMPANIES in the NEWS

Distillers

Distillers Co.'s group trading profit, before depreciation, expanded from £27.26m. to £32.91m. for the year to March 31. Net profit has increased by £3.69m. up to £16.86m.

The company is putting up its dividend from 12½% to 15%.

Langkat Sumatra

The chairman of Langkat Sumatra Rubber, H. F. Copeman, has stated that no profit remittances were received during the past year, and these have still to be received for 1957, 1958 and 1959. He says that it is still not possible to indicate if any of these profits will be remitted during the current year.

The crop was 892,784lb. (899,296) and the current year's estimate was 920,000lb.

UK Rubber Stocks

Total stocks of rubber in London and Liverpool at the end of June last were as follows (in tons):

Liverpool: Plantation rubber, 12,586. Latex (DRC), 802. London: Plantation rubber, 6,404. Latex (DRC), 47. Totals include Board of Trade rubber.

Industry INTELLIGENCE

Technical Data

Polysar Products

Two recent additions to the technical reports issued by Polymer Corporation Ltd., distributed in this country by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4, are Nos. 9:5B and 9:5C.

No. 9:5B describes a Polysar Krylene NS/natural rubber stock, suitable for the production of elastic bands. It has previously been thought that to obtain the high tensile strength, elongation at break and low tension set required of elastic bands natural rubber must be used, but these properties have been adequately developed in a stock based on a 50/50 blend of Polysar Krylene NS/natural rubber at a considerable saving in cost.

No. 9:5C discusses the compounding of Polysar Krynac for high temperature service and gives results of tests carried out with five different curing systems with carbon black and also with magnesia. These show that, by correct compounding, stocks may be prepared which are serviceable in contact with oils at over 300°F.

Inks and Paints

Marking inks possessing adequate resistance to laundry washing and textile processing have in the past almost always been black, and have generally had some disadvantages. It is now possible to prepare, in a range of colours, inks which can be applied by simply writing or stamping, and which require no after treatment to develop them. Details of these inks are given in Technical Information Sheet Dyehouse No. 566 issued by I.C.I. Ltd., Dyestuffs Division.

Information sheet Dyehouse No. 567 gives suggested formulae for producing a number of the green shades illustrated in BS 381C for incorporation in lead-free paints. The limited durability of Brunswick Green pigments on exterior exposure has stimulated interest in the use of organic pigments as a means of producing more durable paints, while the need for lead-free paints in an increasing number of circumstances has added further importance to this trend.

Latex SB2

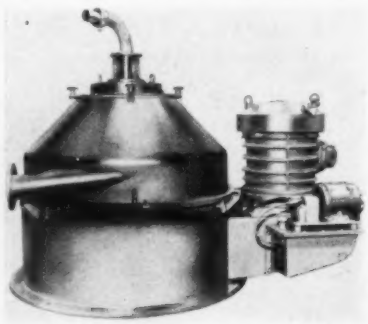
Laboratory Report No. LQ1/1 issued by Monsanto Chemicals Ltd., 10-18 Victoria Street, London, S.W.1, entitled Latex SB2 for Tufted Carpet and Fabric Backing, gives details of the formulation, compounding, application and testing of Latex SB2. This material which is a styrene-butadiene copolymer containing 60% styrene, is recommended for tufted carpet and fabric backing. It requires only few and simple ingredients for compounding, needs no vulcanization and has good tuft anchorage, outstanding heat ageing properties and, due to its stiffness gives the carpet the handle normally associated with woven carpet.

It can also be used as a backing for woven carpets, and for tufted fabrics such as moquettes where it can facilitate handling of the fabric in the dyebath.

Machines, Materials and Equipment

Continuous Screen Centrifuge

The recently introduced Dynoscreen continuous screen type centrifuge is a compact unit of established design for the separation of solids from magmas and slurries. It can function either as a centrifuge or centrifugal screen, handling a wide variety of materials.



Fibrous and granular solids as well as powdery materials possessing free draining characteristics are easily separated, and it is not essential for the specific gravity of the solids to be greater than that of the liquor in which they are suspended. When used to separate crystals from magma, the Dynoscreen will deliver a product of uniform dryness into a dryer at a continuous rate.

Another application is the removal of the liquor occluded by plastics during polymerization.

Small Fire Extinguisher

Nu-Swift have introduced a leakproof, strike-knob, 5lb. carbon dioxide fire extinguisher. Mainly intended for fighting inflammable liquid fires, and fires involving electrical equipment indoors, the new extinguisher has a mean range in still air of 11ft., the carbon dioxide being expelled, for eight seconds at 65°F., through a novel type of discharge diffuser.

Designed for fire fighting at close quarters, the new model, in the hands of an inexperienced fire fighter, is capable of putting out a 6 sq. ft. inflammable liquid fire. In the case of an experienced fire fighter, the corresponding figure is 9 sq. ft.

Publications

Reinforcement of Elastomers

A 107-page booklet entitled 'Fine Particle Reinforcing Silicas and Silicates in Elastomers,' recently published by Columbia-Southern Chemical Corporation gives a comprehensive and scholarly review of the properties of siliceous fillers and their use for the reinforcement of rubber-like materials.

Details are given of the various types of silica and silicates which can be obtained with particle sizes suitable for reinforcing, methods of manufacturing them, and their physical and chemical properties. The major portion of the booklet is devoted to the mechanism of reinforcement, the evidence supporting the theory that this is largely due to the formation of bonds between the polymer and the filler, and the effect of particle size, chemical nature of the surface and the state of aggregation on these bonds.

More specific information on the compounding and application of these fillers follows, with relation to accelerators, activators and antiozonants, silica in SBR chloroprene and butyl rubbers. The last section is devoted to a summary of present uses of silicas in rubber, a comparison of silica with carbon blacks and a forecast for the future competition between them.

Tenite Polypropylene

Moulding and extrusion characteristics of Tenite polypropylene and its physical, mechanical, electrical and other properties are explained in a new booklet published by Eastman Chemical Products Inc., Kingsport, Tennessee, USA. 'Preliminary Information About Tenite Polypropylene' also discusses use of the plastic for moulded applications that require toughness and heat resistance, as well as for film, paper and wire coating, blown bottles, pipe and miscellaneous profile sections. Charts give typical conditions for moulding and extrusion and show typical properties of injection-moulded articles as revealed by ASTM test methods.

In moulding, polypropylene flows easily into the cavities of the die to reproduce all its details with great fidelity. Finished pieces are hard, rigid, tough and glossy, with greater resistance to high temperatures than any other commercially available polyolefin plastic.

Film extruded from Tenite polypropylene has excellent optical properties. It handles well in automatic packaging machinery and may be heat-sealed. Oriented in one direction, it may be cut cleanly and smoothly with a teartape; oriented biaxially, the film has high tear strength in both directions. Its excellent heat resistance indicates its use in boilable packages.

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on July 14 1960

Union Carbide Corporation. Stabilized vinyl alkyl ether resins. 841,088.

Spinnfaser A.G. Process for the utility and crimping intensity of regenerated cellulose textile fibres. 841,401.

Distillers Co. Ltd. Purification of acrylonitrile. 840,331.

Midland Silicones Ltd. Organosilaxane co-polymers. 840,832.

Manufactures des Glaces et Produits Chimiques de Saint Gobain, Chauny and Cirey S.A. Des. Process and apparatus for the manufacture of thermoplastic fibres, particularly glass fibres. 840,862.

Manufactures des Glaces et Produits Chimiques de Saint Gobain, Chauny and Cirey S.A. Des. Process and apparatus for the manufacture of fibres, particularly glass fibres. 840,863.

Dow Chemical Co. Sulpho esters of γ-methylene carboxylic acids and polymers thereof. 840,308.

Dow Chemical Co. Inverse emulsion polymerization of water-soluble monomers. 841,127.

F. Shaw and Co. Ltd. Extruders for thermoplastic sheet. 841,501.

E. I. Du Pont de Nemours and Co. Composite yarns and fabrics made from them. 841,229.

E. I. Du Pont de Nemours and Co. Shaped structures of synthetic condensation polymers and their production and use. 841,230.

E. I. Du Pont de Nemours and Co. Polymerization of ethylenically unsaturated monomers. 841,129.

E. I. Du Pont de Nemours and Co. Polymerization of mono-ethylenically unsaturated monomers. 840,910.

Farbenfabriken Bayer A.G. Process for the production of aryl- and substituted-alkyl thioethers. 840,911.

Montecatini Soc. General per L'Industria Mineraria e Chimica. Metallized fluorocarbon resin. 841,334.

Celanese Corporation of America. Polymerization of ethylene. 840,916.

National Petro-Chemicals Corporation. Ethylene polymerization process. 841,016.

Bataafsche Petroleum Maatschappij NV., De. Process for the preparation of carbon black pastes for use as printing inks or pigments. 841,017.

C. Pfizer and Co. Inc. Plastic compositions. 840,836.

Koninkliike Industriele Maatschappij Voorhen Noury and Van Der Lande NV. Polymerisation catalysts. 840,838.

Goodyear Tire and Rubber Co. Manufacture of flexible cellular materials. 841,272.

Dayton Rubber Co. Textile fibre processing elements. 841,038.

Goodyear Tire and Rubber Co. Method for the preparation of aminodithiothiazoles. 841,419.

Mo Och Domsio A.B. Adhesive compositions. 840,872.

E. I. Du Pont de Nemours and Co. Photopolymerizable elements. 841,454.

American Cyanamid Co. Process for recovering polymer from aqueous dispersion thereof. 841,279.

Esso Research and Engineering Co. Low-pressure polypropylene-silicone gum blends. 841,070.

Thiokol Chemical Corporation. Preparation of aliphatic branched-chain dienes having a halomethyl side chain as a branch thereof. 841,347.

E. I. Du Pont de Nemours and Co. Synthesis of acrylonitrile. 840,880.

Goodyear Tire and Rubber Co. Production of isoprene. 841,351.

Chemische Werke Hüls A.G. Hexachlorpropene. 841,358.

Goodyear Tire and Rubber Co. Polymerization of vinyl alkyl ethers. 841,236.

Open to public inspection on July 20 1960

V. Wolf Ltd., R. Rowe, and J. W. Breakey. Manufacture of polymeric fatty acids. 841,554.

Imperial Chemical Industries Ltd. Cellular materials. 841,863.

Philips Electrical Industries Ltd. Production of articles comprising a conductive metal pattern on an insulating support. 841,364.

Reliance Rubber Co. Ltd. Hot water bottles. 841,865.

C. C. Wakefield and Co. Ltd. Processes for the preparation of esters of acrylic and methacrylic acids. 841,521.

Petrochemicals Ltd. Polymerization catalysts and polymerization reactions. 841,822.

Distillers Co. Ltd. Polymerization process. 841,527.

Styrene Products Ltd. Halogenation of polymeric hydrocarbons. 841,946.

Rohm and Haas Co. Vinyl sulphides of substituted ureas and thioureas and polymers and copolymers thereof. 842,091.

C. C. Wakefield and Co. Ltd. Purification of acrylic and methacrylic esters. 841,522.

Wacker-Chemie G.m.b.H. Process for the manufacture of elastomeric organo-polysiloxane products. 841,825.

Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius and Brüning. Manufacture of liquid ethylene polymers. 841,981.

Imperial Chemical Industries Ltd. Complex silicate fillers. 841,831.

American Cyanamid Co. Polyorgano-siloxane-resin compositions. 841,833.

Chemstrand Corporation. Modified polymers of acrylonitrile polymerized in the presence of preformed copolymers. 841,830.

Monsanto Chemical Co. Modification of rubbery copolymers and compounds for use therein. 841,530.

A. L. Verdier. Process for manufacturing products containing chiefly carbon black and products so produced. 841,881.

Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius and Brüning. Manufacture of polyolefines of high molecular weight. 841,982.

Celanese Corporation of America. Treatment of polyethylene film. 842,104.

British Rubber Producers Research Association. Production of polymeric materials. 842,205.

Firestone Tire and Rubber Co. Polymerization of diolefins. 841,691.

Imperial Chemical Industries Ltd. Polyisocyanate compostions. 842,154.

Imperial Chemical Industries Ltd. Manufacture of copolymers of oil-modified alkyd resins and vinyl compounds. 841,700.

Borg-Warner Corporation. Blend of polymeric products. 841,889.

Argus Chemical Corporation. Polyvinyl chloride stabilizer. 841,890.

K. Ossberger. Production of tubes of synthetic resinous material. 841,637.

Esso Research and Engineering Co. Catalytic polymerization of olefins. 841,638.

Imperial Chemical Industries, Ltd. Water-soluble latent curing catalysts for textile treatment resins. 841,640.

Soc. d'Electro-Chimie, d'Electro-Metallurgie et des Acieries Electriques d'Ugine. Method for the manufacture of methyl acrylate and methyl methacrylate monomers. 842,025.

E. I. Du Pont de Nemours and Co. Regenerated cellulose structures. 841,708.

United States Rubber Co. Method of moulding articles. 841,540.

Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius and Brüning. Process for preparing low molecular weight polyolefines. 841,898.

General Electric Co. Cold joining of polyester resins. 842,225.

Submarine Cables Ltd. Method of bonding thermoplastic materials to metals. 842,134.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

FORMICA BEAUTYBOARD

(796,313) Plastics included in Class 17 in the form of boards. Formica International Ltd., De La Rue House, 84-86 Regent Street, London, W.1. (Class 17; June 7 1960, also under classes 17 and 20).

EVO-STIK "Impact"

(798,374) Adhesives (stationery). Evode Ltd., Common Road, Stafford; manufacturers. (Class 16; June 7 1960).

LORICEL (801,836) Board made from cellulose fibres bonded with neoprene for use in the manufacture of boots and shoes. W. W. Chamberlain (Associated Comp.) Ltd., Wood Street, Higham Ferrers, Wellingborough, Northamptonshire. (Class 17; June 7 1960).

DURACOUR (793,168) Imitation leather consisting of textile fabrics coated with plastics, and articles included in Class 18 made therefrom. Courtaulds Ltd., 16 St. Martin's-le-Grand, London, E.C.1. (Class 17; June 7 1960).

THURENE (793,735) Textile fabrics in the piece impregnated or coated with plastics and prepared for use as stiffening material. Traitements Chimiques Des Textiles, Rue d'Eglise, Vieux-Thann (Haut-Rhin), France, c/o Chas. J. R. Bullough, 14 Somerhill Court, Holland Road, Hove 2, Sussex. (Class 24; June 7 1960).

TUXAN (793,821) Boots and shoes and parts and fittings therefor included in Class 25; and insoles included in Class 25 and protective heelpieces, all made of plastics. La Societe Anonyme Monegasque Difan, Rue de l'Industrie, Plage de Fontvielle, Monaco, c/o Baron and Warren, 16 Kensington Square, London, W.8. (Class 25; June 7 1960).

Increases of Capital

Pelmadulla Holdings Ltd. (644,786). 20 Eastcheap, E.C.3.—Increased by £276,736, in £1 unclassified shares, beyond the registered capital of £100. The company was converted into 'Public' on December 31 1959.

Pataling Rubber Estates Ltd. (166,301). 1/4 Gt. Tower Street, E.C.3.—Increased by £150,000, in 2s. shares, beyond the registered capital of £1,100,000.

Jayar Walbrook Holdings Ltd. (640,927). Distributors, importers and exporters of synthetic rubbers, plastics, etc., 23 Lawrence Lane, E.C.2.—Increased by £99,900, in £1 ordinary shares, beyond the registered capital of £100.

Muar River Rubber Co. Ltd. (164,670). Plantation House, Mincing Lane, E.C.3.—Increased by £760,000 in 2s. ordinary shares, beyond the registered capital of £240,000.

The Manchester Oil Refinery Group has opened a new sales office in Manchester. At a reception to celebrate the opening of the office, which is at Canada House, Chepstow Street, were *(left to right)*: **B. Wardle (chief chemist, Aerialite), B. Lawton (material control chemist, Greengate and Irwell), A. L. Mills (assistant chief chemist, Manchester Oil Refinery) and F. W. Buckley (technical representative, Manchester Oil Refinery)**

NEW COMPANIES

Schulman Plastic Processers Ltd. (661,032).—May 30. Capital: £100 in £1 shares. To carry on the business of manufacturers and processers of plastics and all kinds of plastic goods, etc. The first directors are to be appointed by the subscribers. Regd. office: 37 King Street, W.C.2.

Kemsplast Ltd. (660,999).—May 30. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastic, etc. Directors are to be appointed by the subscribers. Secretary: Thomas A. Herbert, 156 Strand, W.C.2.

Morris Plastic Spraying Ltd. (661,509).—June 3. Capital: £100 in £1 shares. The directors are: William A. Morris and Eileen A. Morris, both of The Bungalow, Caynton, Shifnal and William H. Atkinson, 12 Market Street, Hayfield, Stockport. Regd. office: Caynton, Shifnal, Salop.

Plastrail Ltd. (661,609).—June 7. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastic, etc. The first directors are to be appointed by the subscribers. Secretary: Thomas A. Herbert, 156 Strand, W.C.2.

Glascia Products Ltd. (661,576).—June 7. Capital: £4,000 in £1 shares. To acquire letters patent, and to carry on the business of manufacturers of and dealers in and to process glass, thermo plastics, etc. The directors are: Fred Lowcock, 34 St. Luke's Road, Blackpool; Herbert E. Cockerill, 2 Balham Avenue, Blackpool; William Baines and Joseph N. Taylor. Secretary: F. Lowcock. Regd. office: Leaford Avenue, Mansfield Road, Blackpool.

Key Glass (Plastics) Ltd. (661,802).—June 9. Capital: £10,000 in 1 shares. To acquire a lease of a factory at 77 Barry Road, Willesden, and to carry on the business of manufacturers of and dealers in bottles, jars, etc. The first directors are to be appointed by the subscribers. Regd. office: 33 King William Street, E.C.4.

Faversham Grain Driers Ltd. (661,482).—June 3. Capital: £100 in £1 shares. The subscribers (each with one share) are: Harry J. W. Higgs, Dene Manor, Meopham, Kent, merchant; Harold G. Bicknell, 15 Claremont Road, Bickley, Kent, merchant. Regd. office: Hast Hill, Hayes, Bromley, Kent.

Welda-Plass Ltd. (662,994).—June 22. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in plastics, etc. The directors are: Cyril W. Jones, 33 Orchard Drive, Park Street, St. Albans, Herts.; William H. E. Piggott, Cedar Ridge, Chantry Lane, London Colney; Leslie T. Adams; Harry M. Orde; Alan K. Pomfrey; and Ronald F. Russell. Regd. office: 33 Orchard Drive, Park Street, St. Albans, Herts.

Plyathene Ltd. (662,571).—June 17. Capital: £1,000 in £1 shares. To carry on the business of manufacturers of and dealers in polythene materials, etc. The first directors are to be appointed by the subscribers. Secretary: E. J. N. Nabarro, 5 Bloomsbury Street, W.C.1.

P.S.M. Fibre Glass Developments Ltd. (662,393).—June 16. Capital: £100 in £1 shares. The directors are: Philip V. O'Brien, 50 Heipcroft Road, Withington, Manchester; Frank Corlett, 184 Huddersfield Road, Stalybridge, Ches. Regd. office: William Street, Denton, Lancs.

Plastley Ltd. (661,429).—June 2. Capital: £100 in £1 shares. Other particulars are similar to Plasrabs Ltd. (qv).

Airlite (Plastics) Ltd. (662,766).—June 21. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastic, modelling and moulding materials, substances and compositions, etc. The directors are: Reginald W. Martin, Cranes Mill, Abinger Hammer, Surrey; Mark A. Paschall, 54 Ormsly Lodge, The Avenue, W.4.

Mid-Ards Clothing Co. Ltd. (661,814).—June 9. Capital: £4,000 in £1 shares. To carry on the business of manufacturers of and dealers in water and rainproof coats, etc. Regd. office: 56 Little Horton Lane, Bradford, 5.

Mitra (Plastics) Ltd. (661,217).—June 1. Capital: £6,000 in £1 shares. To acquire the business of Garthnewydd Products carried on by V. G. Worthington and S. G. Haskins at Merthyr Tydfil, and to carry on the business of manufactuers of and dealers in plastics, etc. The directors are: Sydney G. Haskins, 'Dunster,' Waungron Road, Llandaff, Cardiff; Vivian G. Worthington, 'Garthnewydd,' Brecon Road, Merthyr Tydfil; Harold C. Hopkin. Regd. office: Kirkhouse Hall, Dynevor Street, Merthyr Tydfil.

Conwell (Merchants) Ltd. (662,012).—June 13. Capital: £100 in shares. To carry on the business of rubber, cotton, tea, coffee and cocoa and other Eastern and Colonial products merchants, etc. The directors are: James A. Wharton, 61 Forest Approach, Woodford Green, Essex; Louisa M. Dixon, 32 Wellington Road, Bromley, Kent. Regd. office: 10 Bury Street, St. Mary Axe, E.C.3.

Foster Brothers Plastics Ltd. (662,452).—June 17. Capital: £100 in £1 shares. To manufacture and deal in pipes and tubes, etc. The first directors are to be appointed by the subscribers. Solicitors: W. D. Clark, Brookes and Co., West Bromwich.

R·I·P·

CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

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A VACANCY exists for a new junior staff appointment with an old established and progressive rubber hose manufacturer in Hertfordshire as a fitter engineer for supervising the assembling of low pressure and high pressure cotton and wire braided hose and other hose fitting work. Age between 30 and 40 years. Previous experience very necessary.—Apply Box 406. (406)

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APPOINTMENTS VACANT

(continued)

CHIEF INSPECTOR. Large company in the Manchester area will shortly have a vacancy for a chief inspector. The post will involve complete responsibility for the quality of a wide range of products, varying from simple components to fairly complex assemblies. Staff controlled is about 100. Applications are invited from senior inspectors already well versed in government and commercial inspection procedures. Age limits 30/45. Some knowledge of engineering essential. Experience in the rubber industry is desirable but not essential. Academic qualifications are less important than those personal attributes essential in this sphere. Salary and conditions of service are in line with the responsibilities and demands made by this post, which is regarded as a key position.—Brief details in first instance please to Box 401. (401)

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Foreman required for new type of Plastic production in Upper Basildon, Berks.

We offer £25 p.w. plus bonus for suitable applicant with first class rubber or plastic experience. House available at low rent. State details of post-war jobs held, age, and when available for early interview at London office.

Rubber Plastics Limited, 1 Great Cumberland Place, London, W.1. (407)

APPOINTMENTS VACANT

(continued)

FOREMAN, aged 30 to 45 years, to take charge of mill room. Must be fully experienced in handling maximum production and take full responsibility for labour control. Progressive position, pension scheme. Excellent prospects for keen and energetic man. All applications will be treated in strictest confidence.—Apply giving full details to Works Manager, Tuck & Co. Ltd., Peregrine Road, Hainault, Ilford, Essex. (418)

PRODUCTION Manager required for small but rapidly expanding roller covering department of rubber manufacturing works situated in the green belt 20 miles west of London. Engineering machine shop experience essential, and knowledge of rubber processing an advantage, but not absolutely necessary. The position carries a good salary for a man with the ability to lead a skilled team and to plan working programmes. Canteen, pension scheme, etc.—Apply to Personnel Manager, Compressed Rubber Products Ltd., Bell Works, Harefield, Middlesex. (405)

PROGRESSIVE rubber and plastic manufacturers, Southern England, seek assistant to works manager, maximum age 45, with view to appointment to works manager in due course. Ability control labour and knowledge up-to-date rubber technology both essential. Write giving experience and copies of references, salary and full details.—Box 400. (400)

RUBBER distributing agents and merchants require first-class manager with good introductions UK and Continent. Salary, etc., to be arranged, minimum £2,500.—Write Box 409. (409)

SENIOR plastics technologist. A well-established rubber company, which has recently entered the plastics field, requires an experienced plastics technologist to take charge of plastics activities and to assist in the building up of the department. Applicants, in addition to having a plastics qualification or equivalent, should have had considerable practical experience particularly in extrusion and injection moulding of such materials as polythene, p.v.c., nylon, etc., and some knowledge of mould design would be of advantage. The position offers considerable opportunity for men of ability and drive and an attractive starting salary is offered. Applications, giving full details of qualifications and experience should be sent in the strictest confidence to the Technical Director.—Box 414. (414)

TECHNICIAN for East Pakistan. To take charge of progressive rubber factory (footwear). Depending upon experience salary approximately £2,500 per annum tax free, plus furnished house, car and reasonable entertainment expenses. Three year contract, passage paid back to UK for self and family.—Apply Mr. S. E. Ellahi, c/o Standard Engineering Co. Ltd., Evington Valley Road, Leicester. (410)

BUSINESS OPPORTUNITIES

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AMERICAN Corporation with very considerable experience in the production of natural and synthetic foams wishes to co-operate with European manufacturer to produce flexible and/or rigid polyurethane mouldings, etc.—Box 417. (417)

AGENCIES and REPRESENTATIVES

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FOR Switzerland. Productive firm seeks representation of Natur Latex.—Offers to Box No. P.60560 Z, Publicitas, Zurich, 1, Switzerland. (413)

NEW market opportunity. Manufacturers or wholesale distributors of rubber, plastics and allied products desirous of exploring market possibilities in the West Indies and Jamaica in particular are invited to contact a progressive and responsible firm of manufacturers' agents interested in new lines.—Reply to E. M. Gayle, M.A., B.Ss., P.O. Box 66, Kingston, 4, Jamaica, West Indies. (256)

AGENCIES and REPRESENTATIVES

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(416)

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(continued)

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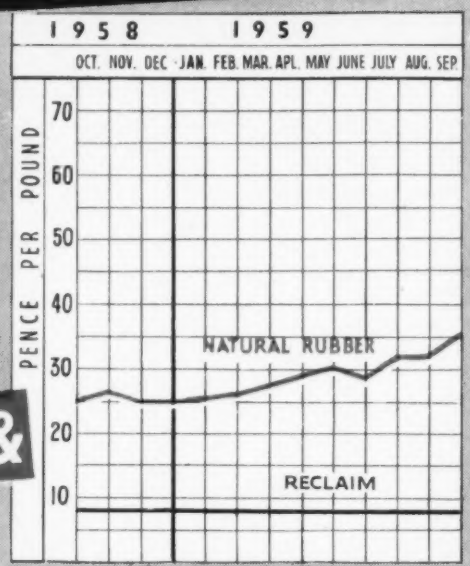

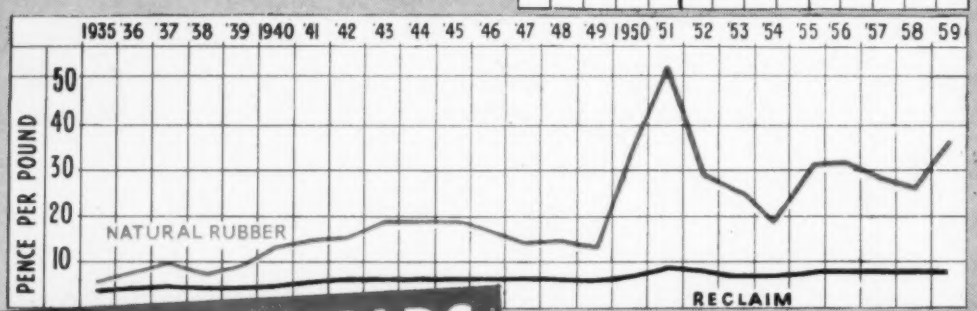

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